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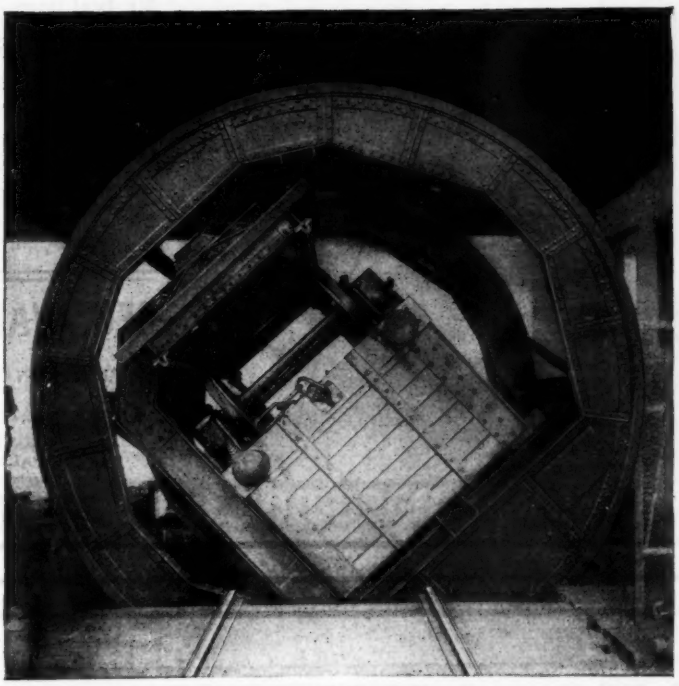

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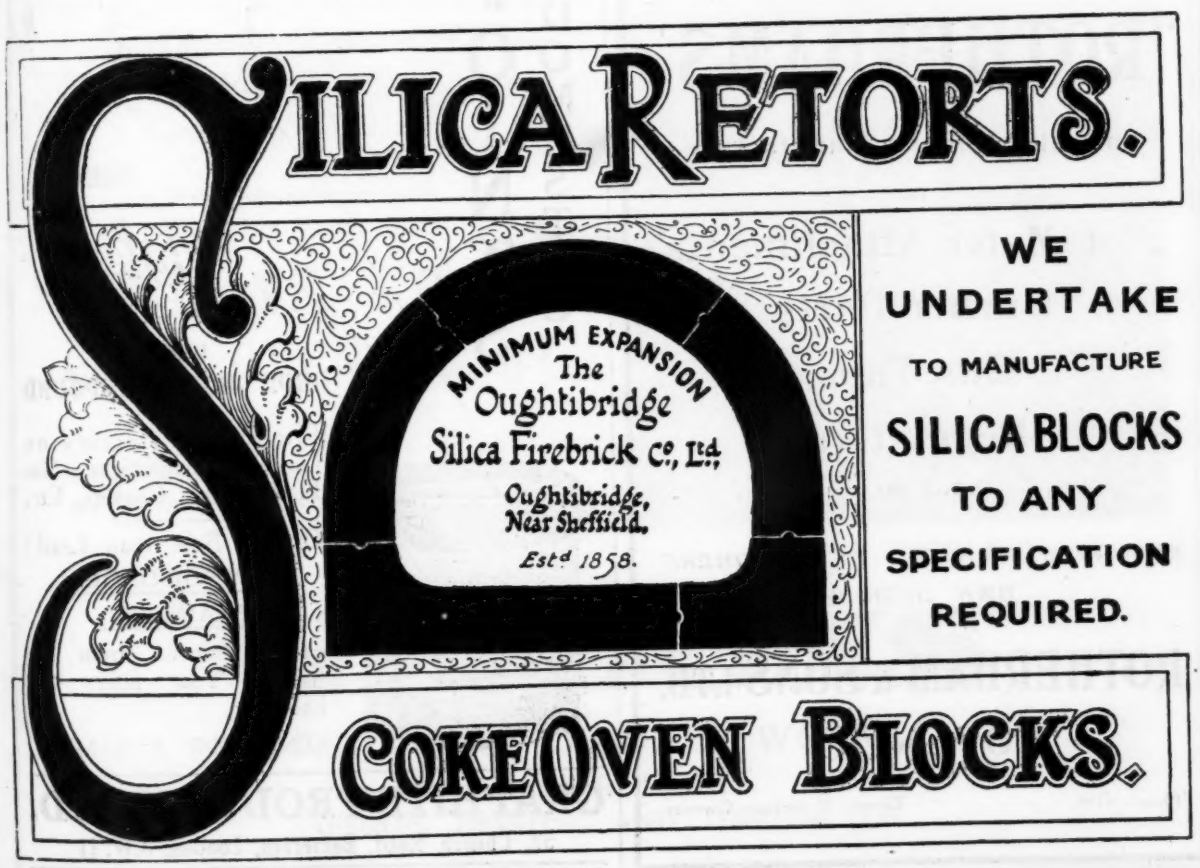
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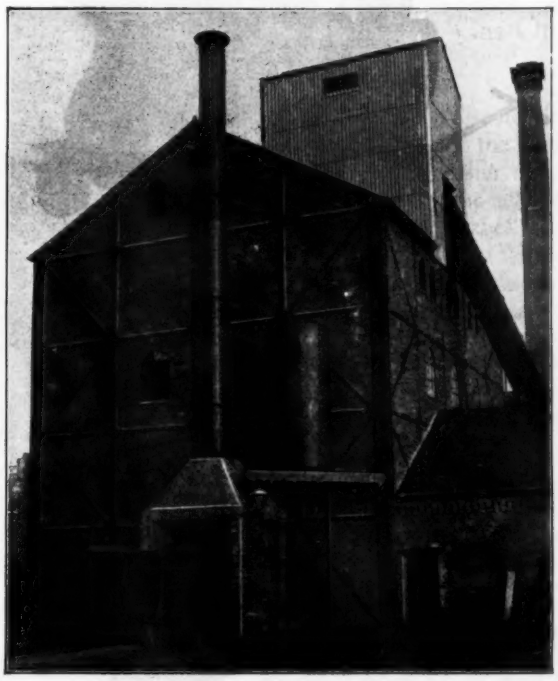

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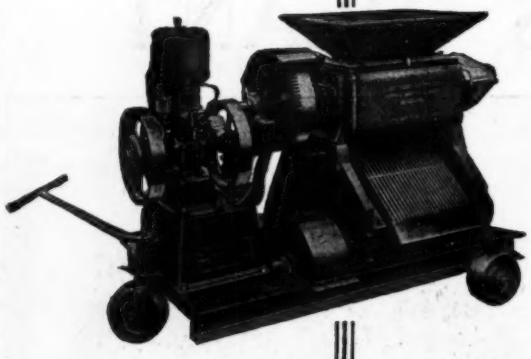

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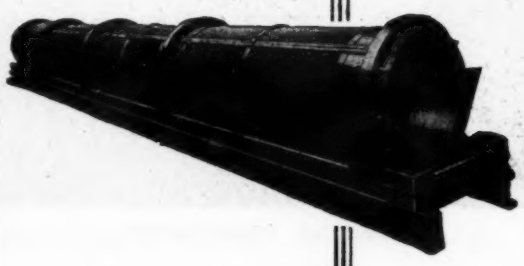

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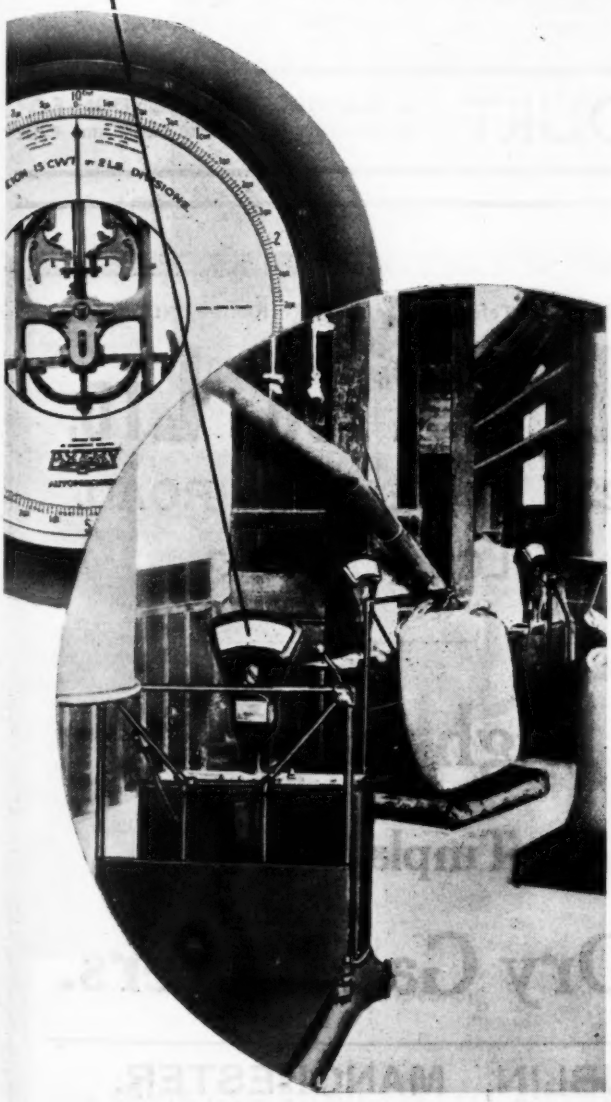

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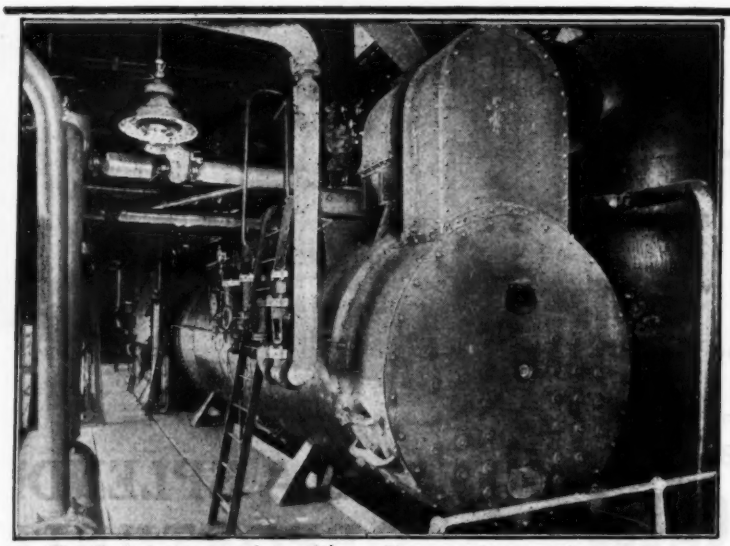

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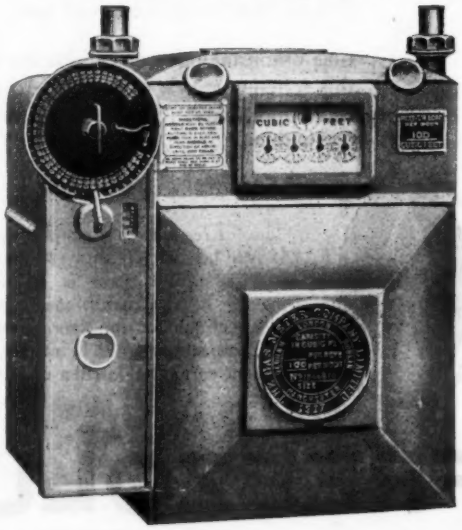

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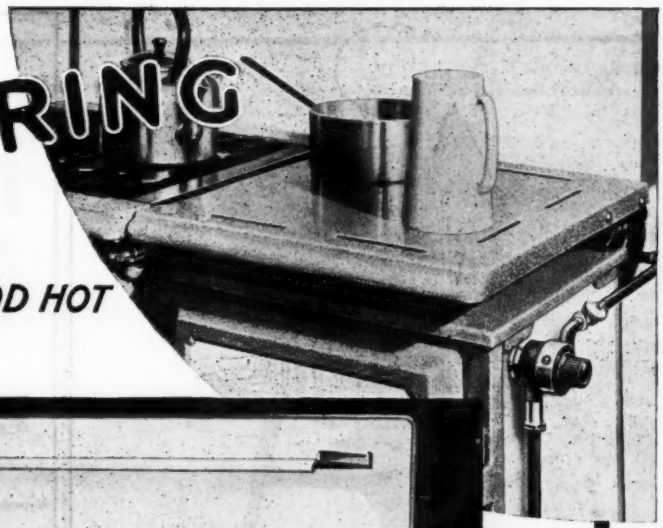

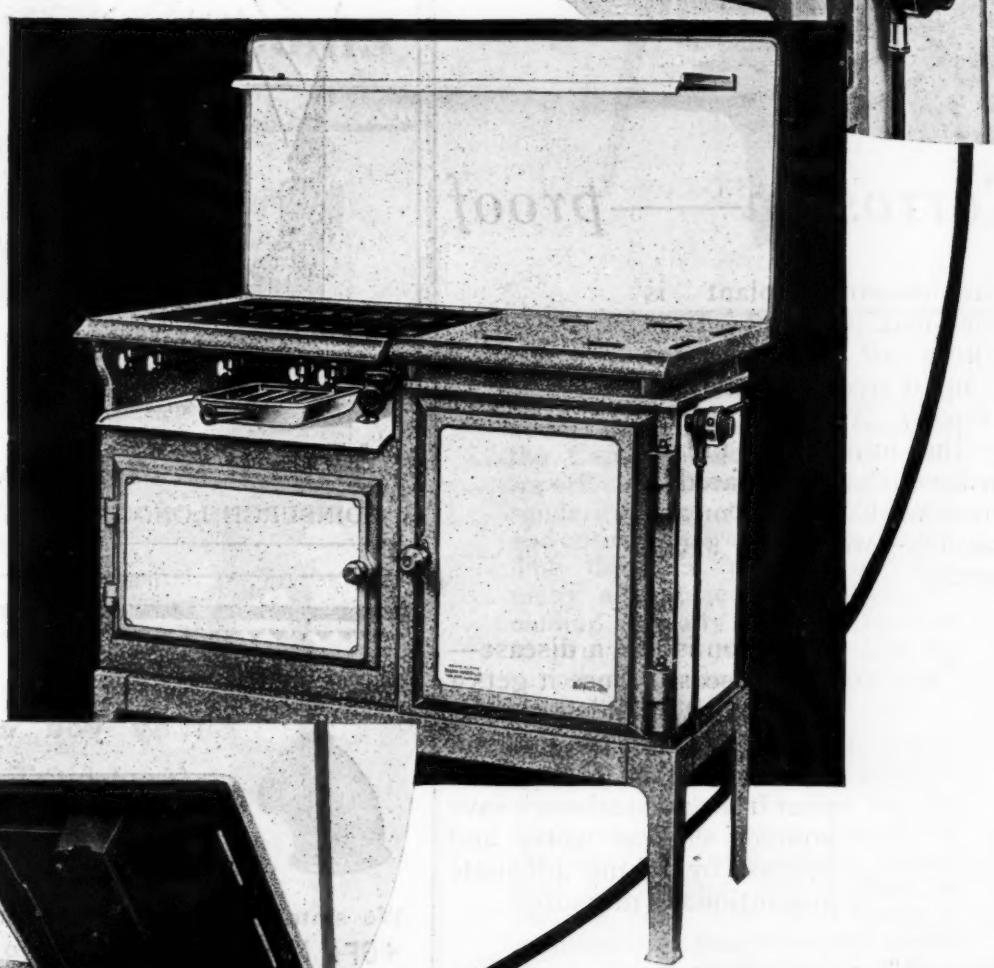

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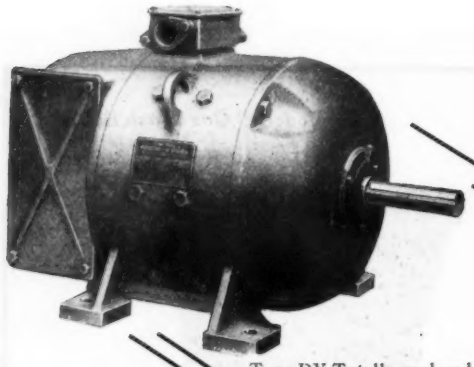

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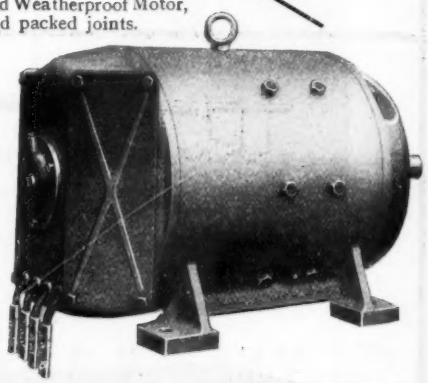

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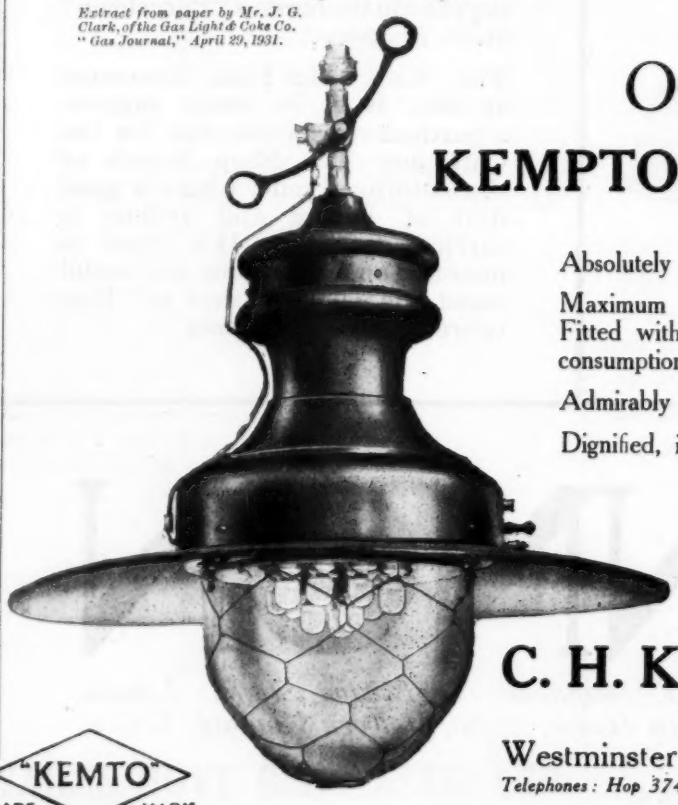

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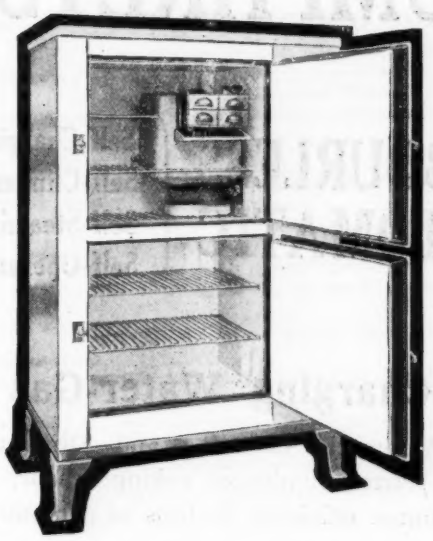

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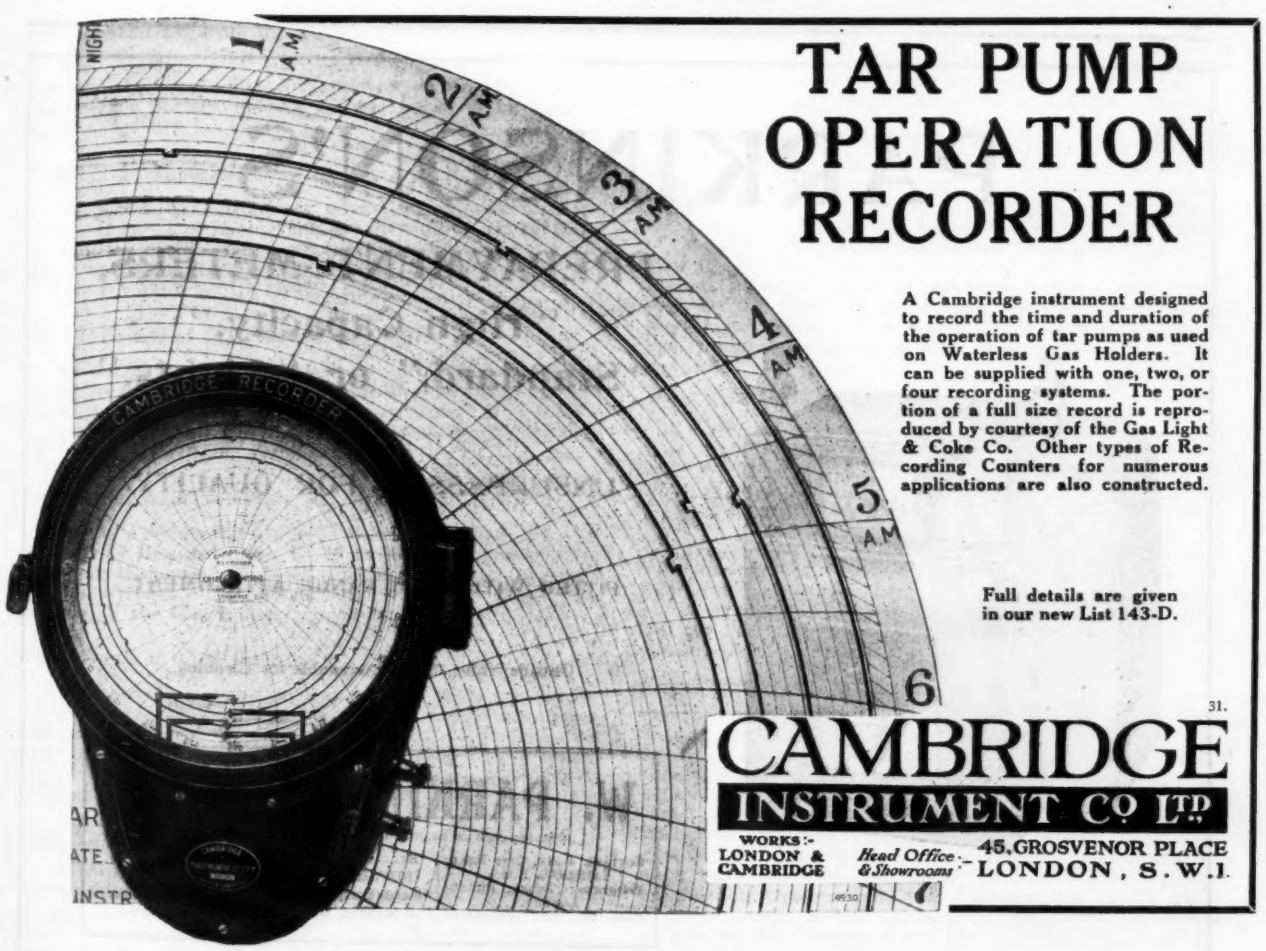

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Vol. 195 83rd Year No. 3560

THE GAS JOURNAL

AUGUST 12, 1931

A Glance at the Contents—

Gas Refrigerator.

A patent has been taken out for a simple refrigerator operated by gas. [p. 382.]

Review.

Reference is made to the 1931 Edition of the Coke Oven Managers' Year Book, which has just been published. [p. 378.]

Mr. Webb's Reply to the Discussion on His Paper.

On a later page will be found the reply of Mr. R. N. Webb to the discussion on his paper read before the Institution of Gas Engineers last June. [p. 381.]

The Artificial Lighting of Schools.

We give this week the report of the Sub-Committee appointed by the Technical Committee of the Illuminating Engineering Society in 1930 on the artificial lighting of schools. [p. 377.]

Distribution Superintendent Required at Rotherham.

As will be seen from our advertisement columns, the County Borough of Rotherham are inviting applications for the position of Distribution Superintendent under the Engineer and Manager. The salary attached to the post will be £400 per annum. [p. 388.]

The Provisions of the Finance Act, 1931.

In our Editorial Columns to-day we comment on the salient features of this annual Statute which received the Royal Assent on July 31. On a later page a summary will serve to direct attention to the amendments made to the Income-Tax Acts, 1918-30. [p. 369.]

Presidential Address of Mr. G. Walmsley.

In his Presidential Address before the Irish Association of Gas Managers, Mr. G. Walmsley, of Londonderry, gives, at the outset, a brief description of the plant at these Gas-Works. He goes on subsequently to discuss the progress of the Gas Industry in Ireland. [p. 379.]

Nitric Oxide in Coal Gas.

Nitric oxide may be present in coke oven gas due to infiltration of waste gas through the walls owing to a strong pull on the ovens. According to H. A. J. Pieters, the content of nitric oxide may increase after the gas has passed through the saturators due to presence of oxides of nitrogen in the sulphuric acid used. [p. 376.]

Heat Lost Through Furnace Walls.

E. Maase discusses the loss of heat through furnace walls, and gives a method for arriving at an approximate estimate of this loss. The effect of the permeability of the walls on the heat loss is considered. This loss is proportional to the permeability of the bricks and to the difference in pressure inside and outside the furnace. [p. 376.]

Results in Glover-West Verticals at Nine Elms.

An article from "West's Gas" in to-day's issue gives details and results of a test of 28 days' duration conducted by the Gas Light and Coke Company last month in a large installation at their Nine Elms Station. The usual mixture of sea-borne Durham gas coals was carbonized. Grading tests made on these coals prior to the tests now reported showed some 45 p.ct. of fines passing through ¼-in. mesh, and close upon 70 p.ct. passing through ½-in. mesh. [p. 378.]

Manufacture of Sulphate of Ammonia.

In view of the low price of and lack of demand for ammonia products, coke oven plants and gas-works are interested in processes for manufacturing fixed ammonium compounds cheaply. B. Waeser describes the Tern electro-nitrogen process. Sulphur dioxide is oxidized in a high-tension flame and the resulting trioxide is combined with ammonia in a Feld electrostatic separator. Oxides of nitrogen are formed and serve as catalysts. The plant, according to French Patent, No. 650,684, is simple. [p. 376.]

Co-Partnership at Aldershot.

The Mid-Southern District Utility Company's Co-Partnership and Hospital and Benevolent Schemes continue to flourish. At the annual meeting held on Aug. 5, the Chairman, Mr. R. W. Edwards, said: "The amount of bonus for the year is the highest ever paid, and I am glad to see, also, that the sums paid in by co-partners to savings account exceed all previous totals. That speaks well for the thrift of our people, and incidentally shows their appreciation of the action of the Directors in fixing a minimum rate of interest on such deposits of 5 p.ct." [p. 366.]

Wola Gas-Works, Warsaw.

A description is given to-day of the reconstructed Wola Gas-Works of the Warsaw Gas Department, from a brochure issued on the occasion of the Annual Conference of the Polish Gas and Water Association. The manufacture and supply of gas at Warsaw, which was formerly in the hands of a concessionaire, passed into the hands of the municipality as a result of the Treaty of Versailles in 1925. In 1923 a Directorate was appointed to control the Gas Department, and they immediately proceeded to study the situation and draft a programme of reconstruction involving the concentration of manufacture in one works, and the complete re-modelling of the apparatus. [p. 370.]

Education for Salesmanship.

We reprint some of the salient points from the Final Report (published last Friday) of what is now usually referred to as "the Goodenough Committee." The general chorus of approval with which the report has been greeted, not only by the General Press—headed by "The Times," which gave it the fullest possible prominence—but by the Technical and Educational Press, must have been very gratifying to the influential Committee as a whole. It must have been especially gratifying to their Chairman, Sir Francis Goodenough, who laboured for nearly three years to arouse public opinion to the importance of the subject to the Commerce and Industry of the country—which is to say to the material well-being of the whole country. [p. 367.]

EDITORIAL NOTES

Education for Salesmanship

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> At present there is still a prejudice against commerce as a career, although there are clear signs that it is departing. In spite, too, of some noteworthy exceptions, educational establishments still regard education for commerce as being less important than education for industry. As a commercial nation, dependent in a peculiar degree upon our commercial transactions with overseas countries, the position can hardly be accepted as satisfactory. There is certainly room for a great development. *It may well be that the industrial revival for which we are all looking will spring, not from the widespread application of electrical power, as some prophets promise, but from the galvanic effect which the development of our salesmanship is capable of creating.*

The italics are ours, but the significant comment is that of an entirely independent pen which we endorse with equal pleasure and interest, as we do the further words with which the article concludes:

> Since October, 1928, when it was appointed by the President of the Board of Education, Sir Francis Goodenough's Committee has studied from all angles the requirements for good salesmanship and how best they may be inculcated. We sincerely hope that the conclusions reached by the Committee as a result of its long and arduous labours will receive the attention and consideration they deserve.

We of the Gas Industry felt proud in 1928 that one of us, our leader on the commercial side, had been chosen to conduct this inquiry. To-day we can feel still greater pride that he has carried through his considerable task with success and distinction; and we gladly join in the congratulations to him and his Committee. But that is a small part of the matter. The main point is: What can we of the Gas Industry learn from the reports which have resulted from the work of Sir Francis and his co-workers, who include not only very experienced and representative members of the Committee, but the officers of the Board of Education who have been at their service? That work will have been of little effect unless the employers of the country study and profit by it, *through their own individual and collective efforts*, as well as by co-operation with the educational organizations of the country.

We are not going to attempt here to answer the question of how the employers in the Gas Industry are to profit by the work of the Goodenough Committee, except by saying: Read their final report thoroughly from beginning to end, and especially note their observation that their findings and recommendations "call for recognition by all employers of what has been proved by some [in the Gas Industry, as well as outside, we would observe]—namely, that they can increase their chance of success in the sale of their goods and services and reduce rather than increase their costs of production and marketing:

> (*a*) By paying close and very thorough attention to the recruitment of their staff for the commercial side of their business and, with that end in view, making themselves fully acquainted with the present sources of supply of recruits of good quality;
>
> (*b*) by offering prospects, in the near as well as more distant future, that will attract the very best types of recruit for their particular purposes;
>
> (*c*) by realizing that, however, naturally gifted a man may be for Salesmanship, his value can be greatly enhanced by—
>
> (i) a sound general education—for developing in him activity of thought, receptivity to ideas and the capacity to speak and write correctly and acceptably in his own and other languages, as well as for providing him with the essential foundations of a knowledge and understanding of the world;
>
> (ii) a grasp of the fundamental principles of commerce and of business methods and organization generally; and
>
> (iii) appropriate instruction and training in respect of his trade, his commodity (*i.e.*, goods or services) and his markets, and the best methods of selling that commodity in those markets;
>
> (*d*) by interesting themselves constantly and thoroughly in the progress of recruits after their entry into business, and in their continued education and training either by their individual firms or through schemes organized by their trade organizations, possibly in co-operation with educational institutions;
>
> (*e*) by giving facilities within working hours for special education and training."

We are much tempted to make a number of quotations from the report, especially from the chapter (the 1st in Part III.) on "Factors in the Problem of Recruitment," and from the pages dealing with "The Training of Salesmen in the Business," and "Instruction in 'Salesmanship;'" but we must leave that for another occasion, concluding now with the assurance to every responsible administrator and officer in the Gas Industry that not to "read, mark, learn, and inwardly digest" the report is to fail of his duty to his undertaking and to the Industry; and with this quotation: "When the instances that have come to our knowledge of bad salesmanship at home and abroad are carefully analyzed, *the root cause* of them is often found in a lack of appreciation of the importance of sound selling principles, policy, and practice by the heads of the business."

We should like every chairman of directors and every chairman of gas committee to read that paragraph over and over until he has decided to ask himself the question and to answer it with complete honesty to himself: Do I appreciate fully the importance to *my* undertaking of sound selling principles, policy, and practice; and do I know fully what they are?

Gas in Poland

We publish to-day an illustrated description of the reconstructed Wola Gas-Works of the Warsaw Gas Department, this description being an abstract translation from an account issued on the occasion of the annual conference of the Polish Gas and Water Association. Both the description and the series of excellent photographs which we reproduce will, we feel sure, be of more than passing interest to our readers; and certainly the article as a whole is indicative of the faith of Poland in the future of the Gas Industry in that country. As being of particular importance, we would call attention to the establishment of a central laboratory and testing station

at the Wola Works—an institution which is to serve as a research station for the composite fuel industries of Poland, and for the refractory materials to be used by them. In this wise move Poland have shown vision, and we are certain that their courage and foresight will be richly rewarded. M. Swierczewski, Director of the Warsaw Municipal Gas Department, was a leading figure in the organization of this enterprise.

The Polish Central Laboratory is fully equipped with the best scientific apparatus and is manned by first-class scientists and technologists. Problems will be investigated relating not only to the Gas Industry itself, but to the whole question of the utilization of coal and other fuels, and, of course, with special reference to gas and coke. The programme which has been arranged is to include a full survey and investigation of the gas coals available in the Polish coalfields, and a complete investigation of every method proposed for the utilization of these national resources to the best advantage. The deposits of brown coal in the country are also to be surveyed and their utilization is to be studied. This work is to be undertaken in collaboration with existing scientific and educational institutions, and it is hoped that schemes will be worked out whereby students specializing in this branch of technology will spend at least one year in the laboratories. We heartily welcome this new organization, which has been conceived on lines commensurate with modern requirements of the gas and fuel industries, and wish it every success.

Turning to the general equipment of the Wola Works themselves, there are many features of interest in this completely re-organized gas manufacturing station. The carbonizing plant, for example, is varied. There are horizontals and chamber retorts, and also continuous verticals. The latter, which will cope with most of the load, are on the Glover-West principle and of a capacity of 4,200,000 c.ft. a day. In his introduction to the account, M. Swierczewski explains that the decision to install these retorts was arrived at only after a searching inquiry, one of the clauses of the contract being a ten-year guarantee of maintenance and costs of production. The installation includes handling machinery for coal and coke, and was put into operation in April of last year. The layout of the plant, a plan of which is reproduced in this issue, is designed to facilitate future extensions. The putting into effect of the entire programme, apart from organization of work undertaken in individual departments of the gas-works, resulted in a reduction of staff by 48 p.ct., and has enabled—in spite of increased costs of labour, of coal, and of other materials—the maintenance of the lowest price of gas in Poland. This price, which is equivalent to 3s. 6d. per 1000 c.ft., is likely to remain unaltered in the near future, and it is a price well capable of meeting competition from other fuels. The Warsaw Gas Department have done well; and it is gratifying that they turned to Britain for their largest carbonizing unit.

In regard to what may be termed ancillary plant, we would call attention to the absence of any Livesey washers, and to the special design of the purifiers, which are designed for a nominal capacity of 4,200,000 c.ft. a day. They consist of four boxes, 23 ft. by 26 ft. by 14 ft., and each box contains eight layers of oxide, each 1 ft. thick, placed on wooden grids, the total volume of oxide in the four boxes being 22,600 c.ft. The arrangement of filling is clearly shown by a sectional elevation which we reproduce. Particularly interesting also are the means adopted to ensure good working in all sorts of weather conditions. The boxes are on supports 10 ft. above ground level. They are enclosed up to the top edge by a steel framework filled in with half-brick panelling, so that the space below the boxes can be heated during the winter to a temperature of about 15° C. Only the top covers are exposed to the atmosphere, and these are insulated with cork lining on the inside to prevent any loss of heat. Benzole recovery, as our readers are aware, is current practice on the Continent; and the plant at the Wola Works at Warsaw has been enlarged so that the total production, including the quantity obtained from the tar, amounts to 1000 tons per annum. Altogether, then, the Wola Works are well worth learning about.

On Many Things

MUCH space has been devoted in the last two issues of the "JOURNAL" to the Presidential Address and the papers read at the seventh annual meeting of the Gas Institute of New Zealand—a youthful, enthusiastic organization which has already accomplished a great deal, which is growing apace, and which will undoubtedly enjoy a bright career of increasing usefulness. Mr. A. Couper, Engineer to the City of Dunedin Gas Department, made his Address a review of the progress of the Dunedin Undertaking, which is believed to be the first concern to introduce gas into New Zealand. That was in the year 1863, and the price charged was a matter of 20s. per 1000 c.ft.—a price, which, needless to say, did not please everybody. However, conditions have altered since that time; and the following quotation from the Address is significant of the manner in which the undertaking has been conducted: "For the year ended March 31, 1930, the Department showed its largest increase in gas sales with one exception. The progress of the Department, in recent years, in spite of keen competition from the Electrical Department, has been most encouraging, and shows no signs of falling off, as to date we are now showing a considerable increase in sales over last year's figures."

Few gas-works can have been erected on a worse site as far as the nature of the sub-soil is concerned, and the chief trouble which the Department has had to face has been uneven settlement of the plant. For example, in 1907 a new retort house was erected, and within a few years it had settled to the extent of 2 ft., resulting in difficult working and considerable anxiety. At the same time a new holder of a capacity of 1 million c.ft. was built, but, such was the settlement that, after it had been in commission for about eighteen months, it had to be dismantled and erected again on a site away from the works. Development necessitated plant extensions in 1925, and naturally the question arose whether it would be better to erect an entirely new works on a different site. The expense of carrying out this measure —£300,000—proved too great, however, and expert advice on foundations was sought. To give an idea of the conditions, we may mention that a bore was sunk to 650 ft. The first 150 ft. showed nothing but harbour silt, then a layer of vegetable matter for 15 ft., then back to the harbour silt for the balance! This result could hardly be termed highly encouraging, but after consideration it was decided to construct a cellular raft foundation, and the new plant was built on this. What settlement has taken place has been uniform, and has not caused trouble. The carbonizing unit chosen for the extension of the works was vertical plant—a plant about which Mr. Couper "cannot speak too highly. . . . the saving in labour alone in our case represented considerably more than £2500 per annum."

Mr. W. A. Joiner, of Wellington, whose paper deals with the production of oil from coal, refers to the formation, at the end of 1927, of a Fuel Research Committee of the New Zealand Council of Scientific and Industrial Research. Among other activities of this Committee is an examination of the behaviour of New Zealand coals on low-temperature carbonization. His review shows the possibilities of converting coals into oils; and, says the author, "although commercial exploitation has not yet proceeded very far, particularly in connection with the hydrogenation and synthetic processes, we may expect before long to see some of these established in those localities where there are abundant and cheap supplies of raw materials." He goes on to say that, though the case of low-temperature carbonization is a little different —for this process usually aims primarily at the production of smokeless solid fuels, or to enhance the value of coals of low calorific power—if low-temperature distillation becomes an established industry, considerable amounts of coal oils will become available. It is therefore of the utmost importance that the industrial applications of such oils should be investigated so that they may yield the highest possible financial return. "Ordinary methods of coal-tar distillation will not be altogether

suitable, and it is here that hydrogenation processes will be usefully applied."

Among other papers at the meeting of the Gas Institute with which we deal are those of Mr. T. Dix, who emphasizes the value of tar to the small gas-works, and urges that everybody should do his best to supply to road departments only tar which is uniform in quality and to a specification which ensures satisfaction in use; and of Mr. C. E. Hibberd, who calls attention to the need for installing meters which are of a size fully adequate to meet the demands which will be made upon them both immediately and in the future. His general observations on meters are most interesting and very much to the point. Then Mr. J. H. Pennington gives a wealth of valuable hints on the lubrication of modern gas plant—information which will prove of great service to the younger members of the gas engineering profession. "Purification of Coal Gas" is the title of a paper by Mr. C. Singleton, who maintains that when purchasing oxide it is desirable to do so on a definite moisture basis. The value of an oxide for purification is, he points out, generally judged by its content of ferric oxide, "but this is not an absolute guide to its activity, and it would appear that the physical condition of the oxide is equally important."

Water Heating and Tariffs

OUR comment on the meeting of the Gas Institute of New Zealand would be incomplete without reference to the topical and spirited contribution of Mr. H. C. Ridley, of Christchurch, on the subject of hot water and gas tariffs. This is an important communication, and thoroughly vindicates the policy of offering special terms to those consumers who install gas storage water heaters. In Christchurch electrical competition is exceptionally severe. Hydro-electricity, which costs the Municipal Electricity Department 1·3d. a unit, is sold for water heating purposes as low as ½d. a unit; and householders are charged a penny a unit for cooking and heating. These rates had their effect. In 1907 the annual consumption per meter was 25,611 c.ft., and in 1929 it was 18,063 c.ft.; the gas concern was losing good business in the city and gaining unprofitable consumers in the suburbs. Let us quote Mr. Ridley: "A consumer does not become profitable until he consumes 1500 c.ft. of gas monthly. We have 10,000 consumers whose monthly consumption of gas is less than 1000 c.ft. Obviously, then, the consumers of over 1500 c.ft. per month are paying for these 10,000 unprofitable consumers. . . . What we want is to raise the average consumption per meter."

Now Mr. Ridley maintains that the reason why business has been lost for gas during recent years is simply because the sellers have been mesmerized by the flat rate system of charge. While the Electricity Department was joyfully installing storage water heaters, the gas undertaking was endeavouring to meet this modern competition by adopting a sliding scale of charges which allowed the small reduction of 5d. per 1000 c.ft. after 10,000 c.ft. had been consumed. This the author describes as "an absolutely farcical rebate for gas service in the home." Electricity was gaining ground simply because of its methods of charge. A special rate and the gas storage water heater came to the rescue. The normal rate for gas in Christchurch is 7s. 2d. per 1000 c.ft.; and the new tariff adopted was as follows: "Where a gas storage water heater is installed and consistently used for all household hot water requirements, the gas rate *for all purposes* shall be 8s. 7d. per 1000 c.ft. In addition, a monthly service charge of 5s. must be paid each and every month." In a very short time (by November of last year) 220 consumers of gas installed storage water heaters, this being necessary under the new tariff. Of these, 122 had a monthly consumption of 958,200 c.ft. Forty-one of these were new consumers; the balance, 81, consumed originally 273,600 c.ft., or an average of 3400 c.ft. per meter. After the water heaters were installed, the consumption rose to 714,300 c.ft., or an average per meter of 8800 c.ft. The Christchurch Gas Company has now definitely thrown over the flat rate method of charging for gas.

Mr. Ridley concludes his paper thus: "Electricity for cooking, water heating, or heating generally cannot give the service to the householder that gas can; and this being so, it is our fault if we let the business go for the want of a little courage and faith."

Finance Act, 1931

THAT the Chancellor's proposals for balancing the Nation's Budget were not so drastic as might have been expected is to conceal the absence from the Finance Bill (which received the Royal Assent and was placed on the Statute Book on the last day of the Parliamentary Session) of any provisions designed to assist British industry, and to damn with faint praise an Act which has all the deficiencies of its predecessors and few of their virtues.

The Act is dealt with in detail later in the "JOURNAL." Our purpose here is to comment on the regrettable omission—either by written words or expressed intention—to ease the burden of the taxpayer; indeed, certain classes will be called upon at a later date to find still further money in the form of the Land Value Tax. Nowhere does one find a reference to the course to be adopted to carry out the economies in public expenditure so necessary to the financial well-being of this country. Rather does the manner in which the Report of the Government "Economy Committee" has been received indicate that few, if any, of such reforms are seriously contemplated.

We also regret the omission of any of the various proposals which have been drafted by the Federation of British Industries and other representative bodies of commerce, and have for their object the introduction of new and improved methods of manufacture.

It will be remembered that last year an amendment to the Finance Bill, 1930, was moved to exempt from income-tax all sums expended for the succeeding three years on plant and machinery. This proposal was lost by only two votes, and was again brought forward this year. Owing, however, to the operation of the "guillotine" resolution and the consequent restriction of the three stages of the passing of the Bill through the House of Commons to fourteen days in all, this and other proposals were not considered by Parliament this year.

Among other matters which were either ignored or which received scant attention were proposals to amend the conditions under which obsolescence allowances are at present granted, to allow for the depreciation of wasting assets, and to amend the Act of 1926—as regards the period during which losses may be carried forward for the purpose of reducing subsequent profits assessable to tax—to accord with the expressed intention of the Legislature at that time.

In regard to the conditions precedent to the granting of obsolescence allowances, we are of the opinion that the slight relaxation of the strict interpretation at present placed upon the term "replacement" in the Income-Tax Acts would do much to foster the installation of more up-to-date, more efficient, and more economical machinery and plant. In our own Industry, such a policy would facilitate the introduction and extension of plant to provide gas for industrial purposes, and to this extent would in some measure tend to relieve unemployment. It is admitted that any or all of these schemes might result in a temporary loss of revenue to the Treasury. While, however, some concessional treatment to enable the tax burden on industry to be adjusted (in order to foster the re-equipment and overhaul of the machinery of industry) is necessary now, the financial benefits accruing from the adoption of these proposals would be reflected in the taxable profits of future years, and would amply reward a Chancellor of the Exchequer who had the vision to apply the accumulated results of experience, instead of adopting the policy of raising revenue by "raiding" non-recurring funds—a policy the precedent for which was established by a former Administration.

We refer to the financially unsound provision (Section 8) whereby the income-tax to be collected in the present fiscal year will be augmented at the expense of the taxpayer and the future.

In conclusion, we must deplore the failure to appreciate the gravity of the financial situation and the appalling state of the Unemployment Fund and its administration. While unemployment insurance was not intended to be a serious drain on the national finances, the present position of the Fund can be remedied only by a drastic increase in the rate of contribution, or, as is the more likely, by the ultimate increase in direct taxation to liquidate the deficiency. A perusal of the Report of the Committee on National Expenditure (the "Economy Committee" appointed to make recommendations to the Chancellor on possible reductions) shows how futile is the present policy of budgetting only for the immediate requirements without regard to future commitments.

PERSONAL

At the last meeting of the Dundee Corporation Gas Committee it was unanimously decided, on the recommendation of Mr. John Wilson, the New Manager, to appoint Mr. JAMES DICKSON, the former Manager, as Assistant Manager of the Gas-Works, at a salary of £500. This was the first meeting of the Committee that Mr. Wilson had attended since his appointment, and he was given a hearty welcome by the members of the Committee.

Mr. RONALD D. KEILLOR, Assistant Manager of the Greenock Corporation Gas Department, has been honoured by his colleagues on the occasion of his forthcoming marriage. At a meeting of the Social Club of the Gas Department, Mr. Alex. Philip, on behalf of the members, presented Mr. Keillor with a suitcase, and wished him every success. At the Inchgreen Gas-Works Mr. Keillor was the recipient of a wireless set from the employees.

The engagement is announced between John Frederick, elder son of Mr. and Mrs. F. J. West, of Wilmslow, Cheshire, and Elsie Doris, elder daughter of Mr. and Mrs. T. Hardie, of Menteith, West Heath Avenue, N.W. 11.

THE NEWS OF THE WEEK

A Dividend of 5 P.Ct., free of income-tax, has been declared at the annual general meeting of Cardenden Gas Company, Ltd., after setting aside various sums for depreciation, reserve, and redemption of debenture funds. The report for the year shows most satisfactory results, and the works have been maintained in excellent condition.

The Half-Yearly Report of the Fleetwood Gas Company shows that £591 was spent under the heading of capital account. The profit was £2347, r duced by debenture and temporary loan interest to £1675. The Directors recommend that this sum, with £49 brought forward, should be allocated as follows: 6 p.ct. dividend on preference stock, 7 p.ct. dividend on ordinary stock, and £75 carried forward.

The Annual Report of the Directors of the Cupar Gas Company, Ltd., shows that the amount at credit of profit and loss account is £2057. From that sum the Directors recommend preference dividends on the £10 and £8 shares of 5 p.ct., tax free, and 8¾ p.ct., tax free, on the ordinary stock. The sum of £400 is set apart to capital for depreciation, and £364 is carried forward. The Directors recommend that the price of gas be reduced by 1d. per 1000 c.ft.

The Hull City Engineer has submitted letters from the British Gas Light Company asking to be allowed to demonstrate improved lighting in two typical streets at their own cost. He also submitted letters from the East Hull Gas Company stating that they were prepared to install trial lighting for approval. It was decided that in the case of the British Gas Light Company, Wright Street and Wellington Lane be used, and in the case of the East Hull Gas Company, Balfour Street be used.

The Cullompton Council accepted the tender of the Devon Gas Association for street lighting on a three years' basis. The tender was £2 4s. per lamp, all of two hundred candle-power, per season, the Company undertaking all maintenance costs and the erection of two additional standards. The Culm Valley Electricity Company sent in a tender of £2 8s. 6d. per lamp of seventy-five watts, equivalent to eighty-five candle-power, and £3 4s. per lamp of one hundred and fifty watts, equivalent to one hundred and ninety-five candle-power.

A Reduction in the Price of Gas was intimated by Mr. John M. Orr, Chairman of the Saltcoats Gas Company, at the annual general meeting of the shareholders recently. The reduction is to be from 4s. 7d. to 4s. 2d. per 1000 c.ft., as from the survey in September next. The revenue for the year was reported to be £15,910, and the expenditure £13,003, showing a profit of £2906. A dividend of 8 p.ct., free of tax, was declared, and a sum of £1500 set aside to a special depreciation reserve account in connection with the recent installation of a new vertical retort plant.

The Tipton Gas Committee are considering a scheme whereby all houses in the town may be supplied with gas.

The Report of the Wellingborough Gas Company states that an interim dividend of £4206 was paid in March, and after providing for interest and other charges there remains a balance of £9564. The Directors recommend that dividends at the same rate as before (7½ p.ct. on the "original" and 6 p.ct. on the "additional" shares, *less* income-tax) be declared for the past half-year.

Chiswick in Semi-Darkness.—During the great storm on Wednesday last, causing the flooding of cables, the electric supply at Chiswick failed, and the whole of the district where electric lighting was in use, including the headquarters of the London General Omnibus Company, was in darkness. The gloom was only relieved by the lights of the Gas Light and Coke Company's consumers.

At the Recent Final Examination held by the Chartered Institute of Patent Agents, Mr. Bertram Thomas King (younger son of Mr. B. T. King, the well-known Patent agent) was successful. Mr. B. T. King (Senr.), Managing Director of Kings Patent Agency, Ltd., 146A, Queen Victoria Street, London, E.C. 4, has been actively engaged in the professional work of patenting inventions and registration of trade marks for over 45 years.

Gas Company's Success at Hospital Carnival.

Three cars, one of which was a First Prize Winner, were entered by the Wandsworth and District Gas Company (Sutton Area) in the Sutton Hospital Carnival last month.

One exhibit, with a humorous theme, attracted much comment and evoked admiration. It was a bright display, consisting of a bathroom scene mounted on a lorry. Two policemen gracefully reclining in the bath caused people to wonder what had become of the Force, until the appropriate slogan made it clear—"A hot bath for two 'coppers,'" by using a gas geyser.

The second exhibit, which secured the First Prize in the Novelty Class, was a baby car decorated and transformed into a huge perambulator. A baby of massive proportions (Mr. J. Davis, the District Superintendent) sat in the front, while "mother" (Mr. F. Ingham, the Chief Inspector), a heavily moustached "matron" of mature years, stood on a wheeled platform at the rear and pushed, or appeared to push, her charge.

A tableau presented by the Sutton Gas-Works Social Club was the subject of the Company's third exhibit, and clearly portrayed the various activities of the Club, from cricket and football to table tennis and darts. Members of the Club, appropriately clad, represented the different pastimes.

THE NEWS—*continued.*

New Industry at Darlington.

Gas Meter Works Opened by the Mayor.

The Mayor of Darlington (Councillor J. D. Hinks) turned the switch to start the machinery at the Rise Carr Gas Meter Works, Darlington, on July 24. The works were opened for repairing gas meters last September, but now the work of making new meters will begin.

While a number of firms with headquarters elsewhere have branches in the North-East, it is believed that this is the first meter-making firm to have its inception in the area.

The owner, Mr. D. Robertson, went to Darlington thirty years ago from Scotland at the time when Alderman Barron was Chairman of the Darlington Gas Committee and Mr. F. P. Tarratt was the Engineer.

NEW POWER PLANT.

The work of making the meters will be carried out on a new power plant by a staff of specially trained men, under Mr. F. Hudson, Works Manager. Some 20 different machines are used in the making of about 80 different parts which go to the make-up of a gas meter. One of the largest machines is the electrically-driven power press for stamping out the tin cases, and another important machine is that which cuts wheels for the indexes and slot adjustments. The completed meters are passed on to the Testing Department, where they are tested under the Board of Trade regulations.

After the Mayor had started the machinery, Mr. A. E. Ruffhead, Engineer and Manager to the Darlington Gas Department, stamped out the case for the first meter to be made at the works. This meter is one of a number to be supplied to the Darlington Corporation.

The Mayor congratulated Mr. Robertson for having sufficient optimism to start this new industry in the anticipation of an improvement in business, and wished him every success.

Mr. A. E. Ruffhead also commented on the optimism of Mr. Robertson, and handed to Mr. Robertson, on behalf of the Darlington Corporation, an order for the first dozen meters made.

Co-Partnership Meeting at Aldershot.

Satisfactory State of Affairs Reported by Mr. R. W. Edwards.

The Annual Meetings of the Mid-Southern District Utility [late Aldershot] Company's Co-Partnership and Hospital and Benevolent Schemes were held together at the Company's sports ground on Aug. 5, under the Presidency of Mr. R. W. Edwards, J.P., C.C., Chairman of the respective schemes.

In presenting the report and accounts of the respective schemes, Mr. Edwards said: There can be no saner remedy for present industrial ills than the policy of giving capitalist and worker, shareholder and employee, a common interest in the business after the manner of co-partnership. Certain it is, at all events, that the most successful and progressive businesses and industries to-day are those which have adopted that principle and policy in one form or another.

So far as gas companies are concerned we find ourselves in good company. Statistics recently published show that there were 59 undertakings at the end of 1930 in which schemes of co-partnership were operating, and the aggregate capital involved was over 84½ million pounds. Since the inception of their respective schemes, these undertakings (covering over 44,000 workers) have distributed nearly 4½ million pounds in benefits. Small wonder that the Industry bears an enviable reputation for freedom from strikes and other crises!

The younger sister of the Gas Industry—electricity—is taking a leaf out of her book, with equally satisfactory results, and fresh schemes are being started year by year.

HIGHEST BONUS EVER PAID.

Turning now to our own report for the year ended June 30 last, you will see that we continue to break records. The amount of bonus for the year is the highest ever paid, and I am glad to see, also, that the sums paid in by co-partners to savings account exceed all previous totals. That speaks well for the thrift of our people, and incidentally shows their appreciation of the action of the Directors in fixing a minimum rate of interest on such deposits of 5 p.ct.

During the year we have added to our Electricity Department other undertakings, and are pleased to welcome the employees there into our scheme. We shall adopt the same measures with other undertakings taken over. The Hospital and Benevolent Fund continues its great work, and is equally prepared to welcome newcomers from our added districts.

We have been almost immune this year from the inroads upon our funds which have characterized some of the recent years in respect of grants for the relief of special cases, and we may congratulate ourselves, I think, as well as our members, upon a cleaner bill of health. Reduced expenditure, under this head, does not, however, in any sense mean that the Committee have been any less considerate or generous in meeting the needs of every case of distress which has been brought to their notice, and I cannot but feel that our workpeople must derive an enormous amount of satisfaction and security from the knowledge that if perchance sickness or ill-fortune should overtake them or their dependents there is a kindly measure of relief always forthcoming to ease their misfortunes and to give them peace of mind, which is perhaps a more potent medicine than any physician can prescribe.

Once again we make our very cordial and grateful acknowledgments to the various hospitals and convalescent homes to which we have the privilege of sending our ailing members, and also to the nursing associations for those attentions, so willingly given, in cases which are less severe but might yet develop seriously without the welcome ministrations of their district nurses.

The Sports Club continues to furnish well-appreciated recreation for our members.

Notes from Scotland.

A Dividend of 6 P.Ct., free of income-tax, was declared at the annual general meeting of Elie and Earlsferry Gas Company.

At the Annual Meeting of Hawick Gas Light Company last week, the accounts for the year showed a profit of £1547, making, with £4998 brought forward, a credit balance of £6545. A dividend of 5 p.ct. was declared, carrying forward £4970. The price of gas is 4s. per 1000 c.ft.

At the Annual Meeting of the Annan Gas Company the report of the Directors showed that the total revenue for the year was £10,637, and the expenditure £9494, leaving a surplus of £1143. A dividend of 7 p.ct., free of income-tax, was declared.

Extension of C.W.G. Plant at Dundee.

The Dundee Gas Committee at a recent meeting had before them the proposed extension of the carburetted water gas plant, which had already been approved by the Gas and Treasurers' Committees, but which the Corporation decided should be held over until Mr. Wilson (the new Gas Manager) had taken office and considered the proposal. The Convener (Mr. A. A. Leslie) said Mr. Wilson had now done so, and thoroughly approved of everything proposed.

The offer made by Messrs. Humphreys & Glasgow, Ltd., makers of the present carburetted water gas plant, and which totals in all £3595—£3075 for the offer itself, and £520 for the electric motor blower which would act as a standby to the present steam turbine blowing plant—was unanimously accepted by he Committee.

£405 is the estimate for the Department's additional portion of the work for foundations, piping, &c.

Forthcoming Engagements.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Sept. 10.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting in Rothesay.

Sept. 16.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of General Committee at 28, Grosvenor Gardens, S.W. 1.

Sept. 17.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Sept. 17.—WALES AND MONMOUTHSHIRE ASSOCIATION.—Meeting at Porthcawl.

Sept. 28-30.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Conference at Exeter.

Oct. 9.—NORTH OF ENGLAND ASSOCIATION.

Oct. 14.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Autumn Meeting in London.

Oct. 27-28.—INSTITUTION OF GAS ENGINEERS.—Autumnal Research Meeting.

EDUCATION . . . . FOR SALESMANSHIP

Extracts from the Final Report of the Government Committee on Education for Salesmanship, of which Sir Francis Goodenough, C.B.E., was Chairman. (The report can be obtained from H.M. Stationery Office, price 1s. 6d. net)

The Meaning of Salesmanship.

We have already said in our First Interim Report that we interpret the term "salesmanship," as Lord Eustace Percy asked us to do, "in the widest sense," and we have taken education for salesmanship to be tantamount to education for commerce on its creative, organizing, and executive sides. We believe the course we have adopted to be in accordance with your wishes.

Fears were expressed in some quarters that the inquiry might be limited to salesmanship in the narrower sense of the work of the retail tradesman and his assistants and of the commercial traveller; and that even if the Committee adopted a broader view, the use of the word might be misleading. We appreciate the point of this criticism, but the explicit statement as to our position, which we reiterate here, can hardly leave any room for misunderstanding. Moreover, we think that the use of the word "salesmanship" in the title of the inquiry has had the positive advantage that it has emphasized, at a time when such emphasis is very necessary, the basic truth that obtaining and retaining a market for goods and services (which is what salesmanship in its widest sense means) is of the very essence of industry as well as of commerce.*

Factories and workshops, warehouses, and showrooms, and all personnel engaged in and about them, exist for the ultimate purpose of producing or distributing goods and services for sale. Such production is obviously in vain unless those goods and services can be marketed with profit to the producer and satisfaction to the customer. The entire organization of every business, from the directors' board room to the packer's counter and the delivery van, exists to serve that one end, and must be directed consciously and constantly towards it if the business is to prosper.

In dealing with the problem of education for salesmanship, we have, therefore, decided to consider education for:

Direction—that is, the formulation of policy on sound principles and the control of administration;

Administration—that is, the organization, management, and supervision of the activities into which the policy is translated; and finally

Execution—that is, the concrete expression of policy in sales and service.

Broadly speaking, the first of the above groups corresponds to the directors, proprietors, and head managers; the second to departmental heads and other senior employees; and the third to salesmen and saleswomen†, whether indoor or outdoor, and whether stationed at home or overseas.

Education for Business Life.

Our inquiry, then, obviously covers the whole field of education for business life, apart from that of those engaged on clerical work. In that connection, however, it may be pointed out that not a little of commercial success depends on the efficiency of the office staff; on their understanding of the basic principle of commerce that every business exists for the service of the customer; and on their realizing that the customer can be caused much trouble and annoyance, and his custom can be jeopardized or completely lost, through ignorance, inaccuracy, inattention, ineptitude, or lack of tact and courtesy on the part of the office staff—which includes not only the senior officers, but the door porter, the office boy, the inquiry clerk, and the telephone operator.

The future commercial prosperity of this country depends in no insignificant measure upon the extent to which the need for adequate and efficient education and training, not only of the leaders and the actual selling staff, but of *all ranks* engaged in commerce, is realized and provided for.

We think, therefore, that it is both desirable and convenient to include in the scope of the report the entire personnel of commerce, and shall, accordingly, refer where necessary to the particular problems and needs of the clerical staff, including the training required in the office arts.

Certain services, of which perhaps the most important are banking, insurance, transport, and auditing, are essential to commerce, but do not, strictly speaking, form part of it. Many of our conclusions will apply to recruitment and training for these professions, but we shall not attempt to discuss the questions which are peculiar to them. This is the less necessary because in each case there is a professional institution which concerns itself with the standard of entry to the profession and the attainments to be looked for from recruits.

General Propositions.

There are certain first principles which we adopt, and which it would, frankly, be waste of time to argue with those who do not.

In the first place, we postulate the possibility of education, if intelligently planned and given, both before and after entry into employment, contributing to the efficiency of commerce. There are perhaps few who would formally deny this proposition, but many of our countrymen are still fundamentally sceptical as to the practical value of education. To take one example, this scepticism may give rise to the remark that the salesman is "born and not made," with the implication that education is something of a superfluity where commerce is concerned.

A Dangerous Half-Truth.

Such a statement is, we believe, a very dangerous half-truth. It is perfectly true that without certain qualities and aptitudes no one will succeed in business; yet many even of these are not necessarily innate, but can be acquired by the child and the adolescent at home and at school. Moreover, innate qualities and aptitudes can with marked advantage be developed and directed rightly by education and training, and this is not less true of the salesman than of others. Apart from that, however, it must be clear to any intelligent observer that there are many attainments which can only be gained by education in some form. A simple example is provided by the question of knowledge of foreign languages: personality is beyond question invaluable, but in overseas trade it may be wasted if it cannot be communicated through the spoken word to a foreign customer.

It is often said that not only the first-class salesman but also the first-class business administrator—the man of genius in commerce, like the man of genius in every walk of life—is to a large extent "born and not made." Great leaders it is true have risen and always will rise to the top by force of character, ability, and energy—in short, of genius. But few if any exist whose natural gifts cannot be more completely developed and more nearly perfected, or whose acuteness of perception cannot be sharpened and their width of outlook increased by education and training as well as by experience. We must therefore ignore the suggestion that education is unnecessary for qualifying men for promotion in commerce—that it cannot help to perfect "born" business pioneers and leaders, as well as "born" salesmen. Moreover, we must realize that, anyhow, there are not enough men of genius—not enough "born" salesmen—to meet the requirements of modern business life. We must depend for the most part on the average man; and it is important that we should not allow the brilliance of the naturally gifted salesman to blind us to the fact that the total volume of business secured by brilliant salesmen is but a small part of the whole.

Competitive Conditions demand Employment of Skilled Personnel.

If our first proposition is granted, as it would be by the overwhelming majority of our witnesses, the second follows almost necessarily—namely, that those engaged in commerce must have the best possible education and training. The country's prosperity depends immediately upon the effective sale of goods, and the standard of any country's marketing is determined by the men and women engaged upon it. Conditions in the world of commerce become more intensively competitive every year. Our progress, indeed our survival, as an industrial nation depends on the

* The term "merchandizing" might perhaps have been used to express what was meant by "salesmanship in the widest sense;" and might be adopted when the importance of the subject has been so widely recognized that a change in nomenclature would not be dangerous. Meanwhile, the sense in which the term "salesmanship" is used throughout this report will, we hope, be clearly understood.

† Throughout this report it is to be understood that "salesman" is used to include both sexes. Women are well suited to the work of selling and are included implicitly in the general term "salesman."

employment in the direction, management, and operation of our commercial and industrial enterprise of first-class personnel soundly educated for the scientific as well as the vigorous conduct of business.

Our first Interim Report made it clear that, for the overseas markets, which are of such vital importance, an increase in both the number and the quality of our commercial representatives, whether principals or salesmen, is urgently necessary. Our evidence has further proved that the complementary need is becoming more and more widely recognized—namely, that of better educated, better trained staff for the home direction, administration, and general operation of business, to enable us to maintain and improve our commercial and industrial status. Unless that need be recognized and suitable action be taken, our trade will pass in growing measure to those who attach full value to the well educated and trained man in preference to the ill educated and untrained.

We approach the problem therefore as one of examining the whole of our educational system in relation to the production of men and women having the qualifications of character, intelligence, wisdom, knowledge, and ability that will fit them for the various ranks of our commercial army.

This proposition is without prejudice to such questions as the relation of general to specialized education, and of the knowledge gained in the school to experience gained in the business, questions into which the problem divides itself and which will have to be discussed later.

A Complex Problem.

This is a convenient place at which to point out that the problem of Education for Salesmanship in its broadest aspects, as well as in the more narrow, is a complex one, the study of which includes consideration of:

(*a*) *General Education* for the development in the student of activity of thought, receptivity to ideas, and the capacity to speak and write correctly and acceptably in his own language and in one or more other languages; as well as for providing him with the essential foundations of knowledge of the world in which he lives and will be called upon to work.

(*b*) *Special Education and Training for Commerce.*—(1) *General*—for imparting knowledge of business principles, organization, and methods in general; (2) *Particular*—(*a*) for imparting knowledge of the trade in which the employee is engaged, or for which the student is being educated, and of the commodity with which he is concerned; and (*b*) for training the employee in the "science and art" of dealing with the individual customer—including the handling of correspondence, complaints and disputes, as well as the actual obtaining of orders.

For the employer, therefore, the problem is one, first, of finding the recruits for the various branches of his commercial operations who have received (*a*) the most suitable general education, and (*b*) such degree of general instruction in commerce as he thinks desirable before they enter his employment; second, of seeing that his employees receive such further general instruction in commerce and such particular education in his own trade as will best fit them for service in that trade and their advancement in life; and, third, of providing them with training that will make them as efficient links between himself and his customers as their personalities and abilities permit them.

For the educationist, the problem is how best to co-operate with the employer in securing these results with simultaneous advantage to the general culture of the individual student.

Our report is directed to the consideration of those problems from both standpoints.

Before proceeding to that consideration, however, we want to express very strongly the view that a fundamental weakness in our national life to-day which is the source of much of the shortcomings in "salesmanship" to which we drew attention in our First Interim Report, consists in our failure as a great industrial nation to realize the importance of employing fully as high a type of personnel for dealing with the problems of marketing as we are prepared to employ for dealing with the problems of production. When the instances that have come to our knowledge of bad salesmanship at home and abroad are carefully analyzed, the root cause of them is often found in a lack of appreciation of the importance of sound selling principles, policy, and practice by the heads of the business. The best brains in too many firms are too exclusively concentrated on the problems of production—problems which are as fascinating as they are important, and ever-present to the eye and ear as well as to the mind of the management—while the problems of marketing, which are of the very first importance and ought largely to govern the policy of production, unfortunately, often receive either scant consideration by the heads of the business or are relegated entirely to subordinates, because they are less concrete than the problem of production and impress themselves less obviously on the senses of the management.

The remedy for this serious state of affairs is the recruitment on the commercial side of every industry of young men of the very best general education who display and have had developed in them during their education the qualities of enterprise, initiative, adventure, courage, judgment, and leadership which best fit them for the organization and conduct of progressive selling policy and practice.

Unless and until what may be called the "heroic" view of commerce as a national service of a high order is absorbed and taught in our schools, we shall not secure our place among the leaders of commerce in the competition for world markets.

We desire to stress this fundamental point at the very outset of our consideration of the whole problem of Education for Salesmanship.

We may next mention another subject which, though less in the nature of a first principle, has influenced radically our approach to the problem.

At a number of points in this report we shall have to refer to the defective knowledge possessed by employers of what is at present being done and of what might be done in the schools; and of the sources upon which employers can already draw for the recruitment of commercial as well as technical staffs.

Although we, as business men, cannot speak with the same certainty as to the knowledge possessed by teachers and educational administrators of the changing structure of industry and commerce, we are of opinion that it is often defective. However that may be, contact between industry and commerce must be secured and strengthened. Progress can only be made if each of the two parties concerned is fully informed of the functions performed and the general organization adopted by the other.

Our report is directed to this end, as well as to the consideration of questions affecting school organization and programmes.

Our survey of the present system will serve moreover the purpose of a basis from which to start consideration of proposals for such steps as may be found desirable in order to make it better serve the needs of commerce and industry without becoming any less truly educational.

PREJUDICES AGAINST COMMERCE.

Evidence from many directions points to the rapid decline of prejudice against commerce as a career on the part of teachers, parents, and pupils alike. There is a growing appreciation of the fact that commerce is not merely a profitable but a worthy and interesting career, in which the best type of man and woman, inspired by the highest ideals of service, can find full scope for the development and use of both character and ability.

We believe, indeed, that there is, further, a growing realization of the pressing need, to which we have already referred, for this country to have in the ranks of its commercial army a greater proportion than hitherto of the pick of the nation's manhood, of those who have the qualities of character, as well as the abilities, necessary to the conduct of business in a world that becomes more highly organized and competitive every day.

In particular, we can state with confidence that the staffs of secondary and public schools, as well as the university authorities, are fast shedding the prejudice against a business career which was at one time very prevalent. This process will be expedited if commerce and education enter into closer relations and come to a better understanding of each others' interests and aims.

It may, indeed, be said that the problem to-day is rather to persuade employers that it will be to their advantage to employ such men and women, to train thoroughly such already well-prepared human material, and, last, but far from least, to pay them all that they are worth.

Finally, we assume that, taking the commerce of the country as a whole, whatever the variations in the organization of individual firms, there will be no bar to prevent the highest positions being filled in part by promotion through various grades from the lowest. This practice, involving the principle of "vertical mobility," is characteristic of English business and has many obvious merits. We also assume, however, that recruitment direct to higher ranks from secondary schools and universities will continue; indeed it is probable, and we certainly hope, that it will increase. The combination of such recruitment with "vertical mobility" conditions most of the educational questions which we have to consider, and itself presents problems of no little complexity and delicacy. These can be overcome if the principle of recruitment and promotion entirely upon merit is adhered to without exception.

[The main conclusions and recommendations will be given in our issue next week.—ED., "G.J."]

The Provisions of the Finance - - - Act, 1931 - - -

Summarized as they affect our readers

In our Editorial Columns to-day we comment on the salient features of this annual Statute which received the Royal Assent on July 31. The following summary will serve to direct attention to the amendments made to the Income Tax Acts, 1918-30.

Part I.—Customs and Excise.

The rate of customs duty payable, as from April 28, 1931, on hydrocarbon oils is increased to 6d. per gallon (*section* 1). As has been pointed out in the "Journal" by "J. H. B.," May 6, 1931, p. 343), this increased duty on petrol amounts to a preferential tariff in favour of benzole to the extent of 2d. per gallon.

A mechanically-propelled vehicle which is "to a substantial extent" used for the conveyance of goods, and is also used for the conveyance, without charge, of employees, is not to be taxed a higher rate of duty (under section 14 of the Finance Act, 1922) solely by reason of being so used (*section* 2), while section 13 of the Finance Act, 1928, is amended in order to give relief in the interpretation of the licence duty payable in respect of motor vehicles having a trailer (*section* 3). The Chancellor, in his budget speech, announced his intention to reduce the annual tax chargeable on motor bicycles of a low cylinder capacity—to encourage the manufacture in this country of a new type now being rapidly developed on the Continent; and this has been given effect to in the Finance Act (*section* 4).

Part II.—Income-Tax.

The standard rate of income-tax for the fiscal year ending April 5, 1932, is continued at 4s. 6d. (four shillings and sixpence) in the £, and the provisions with regard to income-tax which were in force for the year 1930-31, are re-enacted for the current year (*section* 5).

The recent case of Hamilton *v.* Commissioners of Inland Revenue (1931; 10, A.T.C.1) upheld the long-established practice under which a company deducts income-tax from the full amount of dividend paid out of profits of a revenue nature (irrespective of the amount on which the Company has been assessed to tax for that particular period), and whereby the full amount of such dividend is regarded as income of the recipient for all purposes—*i.e.*, income-tax and surtax. As some doubt had been expressed as to the legal position in circumstances slightly different from the Hamilton case (in which the Court of Appeal have disallowed the appeal of the taxpayer), provision is made to clarify the position regarding the construction of Rule 20 of the General Rules applicable to all Schedules of the Income-Tax Act, 1918. It is now enacted that the deduction of the appropriate tax from any dividend in accordance with Rule 20 shall, whether before or after the commencement of the 1931 Act, be computed as if the provisions of the Income-Tax Acts actually require the calculation to be made for the year corresponding to the period of the dividend—instead of by reference to the profits and gains of the preceding year (*section* 7). This construction of Rule 20 is expressly excluded in the case of preference dividends to which section 12 of the Finance Act, 1930—*i.e.*, dividends paid by a company liable to Dominion income-tax—applies. (Proviso to *section* 7 (2).) This section is retrospective in its effect and will prevent the Hamilton case being taken to the House of Lords. The war-time concession conferred by the Finance (No. 2) Act, 1915, whereby tax under Schedules B, D, and E (*i.e.*, excluding income from lands and certain Government securities under Schedules A and C) was made payable in two equal instalments on Jan. 1 and July 1 in each year has been withdrawn, and such tax will in future be due as to three-quarters of the total tax on Jan. 1 and one-fourth on July 1 (*section* 8). Companies will not be affected by this amendment, as the full tax is payable in one amount on or before Jan. 1 in each year. The concession as regards Schedule A tax was withdrawn by the Finance Act, 1927; and tax under this Schedule has since been due on Jan. 1 in one sum.

Part III.—Land Value Tax.

A Land Valuation Bill was introduced in 1930, but was not proceeded with by reason of pressure of Parliamentary business. The present Finance Act provides only for the necessary preliminary step of valuation; the actual taxation of land values will not come into force until the year 1933-34 and subsequent years. The rate is one penny in the £ based on the land value of every "land unit" (*section* 10), but it is to be noted that no maximum rate is specified and accordingly there is no guarantee that this additional source of income will not, at some later date, be made to yield a sum greater than the £40,000,000 per annum at present contemplated.

The provisions for the valuation of every "land unit" are necessarily complicated (*sections* 11-13 *and First Schedule to the Act*) and right of objection and appeal is most essential. No less than 9 sub-sections endeavour to set out the manner of exercising this right (*section* 14). The amendment and keeping of registers is provided for (*section* 15), and the method of assessment, recovery, and recoupment is specified (*sections* 17-23). To gas undertakings the most important provision is the exemption from the tax of a "land unit not subject to a lease granted for a term exceeding fifty years" which "is owned by a body of persons authorized by any Special Act, or Order having the force of an Act, to construct, erect, or carry on as its principal business any railway . . . gas . . . or other public undertaking" (*section* 24 (1) (*d*)). It will be noted that this exemption is restricted to (i) statutory undertakings, and (ii) undertakings where the manufacture and distribution of gas is the principal business. No reason is offered for differentiating between statutory and non-statutory companies.

Power is given to the Commissioners of Inland Revenue to require and obtain information regarding the ownership, rent, landlord, and charges upon the land, and they have the power to authorize a person to "enter on and inspect at all reasonable times" any land for the purpose of the Land Values tax (*section* 27). Instruments by means of which a transfer of land is effected, or a lease granted, must be produced to the Commissioners (*section* 28 *and Second Schedule*) under a penalty not exceeding £10 for non-compliance. The expenses incurred by the Commissioners in carrying out the valuation of land under the Act is to be defrayed from moneys provided by Parliament (*section* 34). This Part of the Act is applicable (with modifications set out in *section* 35) to Scotland, except that there is no right to appeal to the High Court. In England and Wales a single judge of the High Court is to be nominated by the Lord Chancellor and either party shall have the right of appeal from the decision of a County Court direct to the Court of Appeal (*section* 30 (3)).

Part IV.—Miscellaneous and General.

The Treasury is empowered to raise a loan—for the purpose of assisting the Road Fund to meet the cost of road schemes undertaken for the relief of unemployment—not exceeding in the aggregate £9,000,000 (*section* 36).

The transfer to the Commissioners of the power to appoint Collectors of Taxes (*section* 37) has met with much criticism, and the decision to take the appointment out of the hands of the Local Commissioners of Income-Tax has been the means of removing the "buffer" between the taxpayer and Somerset House. On the ground that the proposed transfer was recommended by the Royal Commission on the Income-Tax in 1920, as a method of ensuring centralized collection of income-tax under the various schedules, the section has been agreed to, but accountants and many bodies of Commissioners of Taxes have opposed the transfer, while many Collectors of Taxes are sceptical as to the advantages offered them in exchange for becoming part of the Government machine. It is the general view that the taxpayer stands to lose by this change.

Section 47 of the Finance Act, 1930, is repealed, and thus additions to the new Sinking Fund which was created as a result of the last Finance Act are temporarily suspended (*section* 38) in order to assist the Chancellor in meeting the deficit on the National Accounts. Similarly the obligation imposed by Mr. Snowden last year (Finance Act, 1930, section 48) on all successive Chancellors of providing in the event of a deficit in any year for the redemption in the following year of a corresponding amount of debt, has been rendered non-effective in respect of the deficit on the National Accounts for the 12 months ended March 31, 1931 (*section* 39).

The currency of War and National Savings Certificates may be extended by the Treasury up to a period not later than March 31, 1940 (*section* 43).

WOLA GAS-WORKS, WARSAW - - -

A description of the reconstructed Wola Gas-Works of the Warsaw Gas Department, from a brochure issued on the occasion of the Annual Conference of the Polish Gas and Water Association

[See the "JOURNAL" for May 20, p. 484]

INTRODUCTION BY DIRECTOR SWIERCZEWSKI.

[ABRIDGED.]

The manufacture and supply of gas at Warsaw, which was formerly in the hands of a concessionaire, passed into the hands of the municipality as a result of the Treaty of Versailles in 1925. Manufacture was carried on in two works, one in Ludna Street, which dated from 1856, and one in Dworska Street (the Wola Works), which was put into operation in 1888. In 1923 a Directorate was appointed to control the Gas Department, and they immediately proceeded to study the situation and draft a programme of reconstruction involving the concentration of manufacture in one works, the second mentioned, and the complete re-modelling of the apparatus.

From 1919 to 1923 the management of the works was in the hands of the Court Liquidator. He found that retort house No. 1 at Wola was in very bad condition, due principally to the failure of the foundations, and he therefore commenced at once to transfer a number of the settings to retort house No. 2.

The present management proceeded with the execution of the following reconstructions at the Wola Gas-Works:

(*a*) The completion of the reconstruction of retort settings by dismantling one bench containing 5 settings of 18 retorts in No. 1 house, and the reconstruction of a similar bench in retort house No. 2, giving a total daily capacity of 34,000 cub.m. (1,200,000 c.ft.).

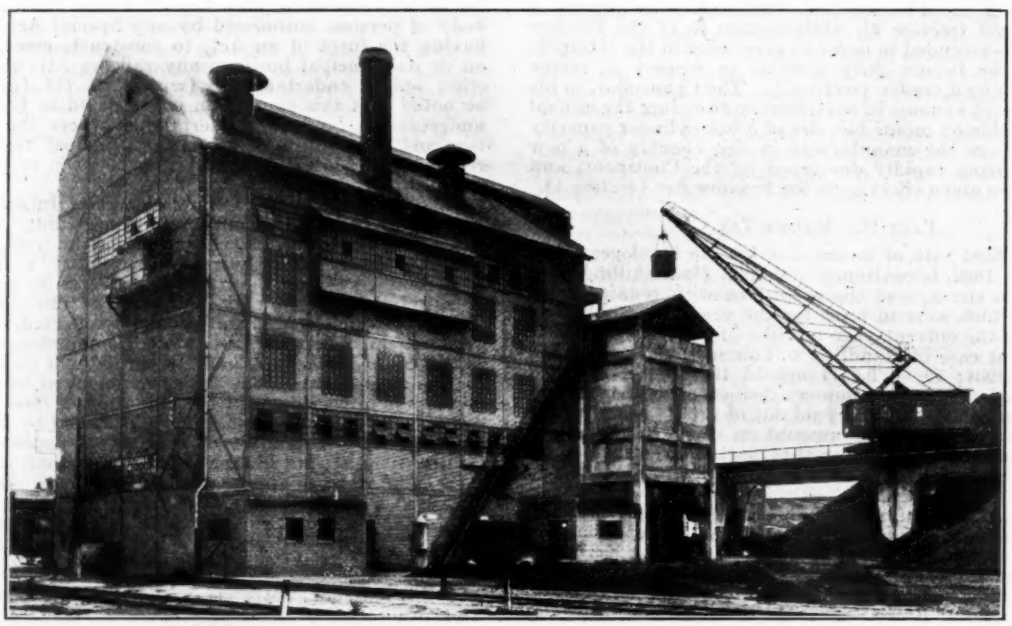
(*b*) The dismantling of a further bench containing 5 settings of 18 retorts in retort house No. 1, and the construction of a bench containing 6 settings of chamber retorts, a total of 80 chambers, of a daily capacity of 40,000 cub.m. (1,400,000 c.ft.).

(*c*) The erection of a new retort house of a daily capacity of 120,000 cub.m. (4,200,000 c.ft.).

Item (*a*) in the programme was carried out with material entirely of local origin, and the work was executed entirely by Polish engineers and workmen.

Item (*b*) is also being carried out by Polish engineers with Polish materials. It is anticipated that these retorts will be put into operation in the autumn of the current year.

Item (*c*) gave rise to a lengthy study and inquiry into the several systems of carbonization available. Offers were invited for plants of the latest type, with a daily capacity of 120,000 cub.m. (4,200,000 c.ft.), and including ten years' guarantees of maintenance and costs of production. Finally, the tender of West's Gas Improvement Company, Manchester, was accepted for an installation of their Glover-West vertical retorts. This installation includes handling machinery for coal and coke, and was put into operation in April, 1930. The greater part of the materials and labour was supplied from Polish sources on the basis of plans drawn up jointly by Messrs. West and the Gas Department's engineers, checked by Polish experts.



THE INSTALLATION OF GLOVER-WEST VERTICAL RETORTS AT THE WOLA GAS-WORKS.

After closing down the works at Ludna, which took place on Dec. 19, 1930, the Warsaw Municipal Gas Department had at its disposal the following carbonizing plant:

	Daily Capacity.	
48 Glover-West vertical retorts . .	120,000 cub.m.	(4,200,000 c.ft.)
180 retorts left by the former Concessionaire	68,000 ,,	(2,400,000 ,,)
98 retorts erected by the present Directorate	34,000 ,,	(1,200,000 ,,)
30 chamber retorts	40,000 ,,	(1,400,000 ,,)
Total	262,000 cub.m.	(9,250,000 c.ft.)

As regards the production of steam, the Directorate found there were as many as seven boiler plants. All were in bad condition, and consisted of boilers of obsolete types. It was therefore decided to construct one central boiler house in the Wola Gas-Works with four modern water-tube boilers with a total heating surface of 1000 sq.m., which, together with the steam produced from the recovery of waste-heat in the Glover-West installation, entirely meet the requirements of the works. All these boilers were supplied and erected by Polish engineers.

The apparatus for cooling and purifying the gas had next to be considered. The apparatus left behind by the Concessionaire in the Wola Gas-Works was estimated for a daily capacity of 120,000 cub.m.; and while this could be increased to 150,000 cub.m., it could never be relied upon to deal with 200,000 cub.m., and certainly not with

the 262,000 cub.m. which was the estimated capacity of the retorts which were to be installed. It was decided to retain the existing cooling and purifying plant, but to supplement it by the erection of new apparatus, so that the two together would take care of the requirements, at any rate, for the near future. It was decided to erect the following: Instead of the old condenser, new ones were erected for a daily capacity of 300,000 cub.m.; two additional exhausters for a daily capacity of 240,000 cub.m., while the old ones were retained; two tar extractors instead of the old ones, for a daily capacity of 240,000 cub.m.; two ammonia washers for a capacity of 120,000 cub.m., retaining the old ones; and dry purifiers for the removal of sulphuretted hydrogen for a daily capacity of 120,000 cub.m., retaining the old ones. The whole of this apparatus has been in operation since last year, and since December, 1930, the whole of the gas manufacture has been concentrated at the Wola Gas-Works.

The reconstruction and re-arrangement of the apparatus, including carbonizing plant, has been so designed as to allow of the erection of further sets of apparatus in units of 120,000 cub.m. daily capacity until a total final capacity of 500,000 cub.m. is reached.

This description would not be complete without mention of the booster plant which has been erected at the Wola Gas-Works for the transport of gas to the existing gasholders at Ludna Street, the reconstruction of the chemical works at Dworska Street, and the installation of a central laboratory and testing station on the same works.

Finally, although the present description does not deal with distribution, it is only fair to mention the reconstruction and extension of the city's gas mains from a length of 360,346 m. (222 miles) in 1924 to 458,261 m. (285 miles) on Jan. 31, 1931.

The carrying-out of the above programme, apart from the proper organization of work undertaken in all individual departments of the gas-works, resulted in a reduction of staff by 48 p.ct. (from 1563 persons engaged in 1924 to 812 on Feb. 1, 1931) and enabled, in spite of the increase in the costs of labour by 73 p.ct., of coal by 83 p.ct., and of other materials by from 10 to 138 p.ct., the maintenance of the lowest price of gas in Poland, and, indeed, a price as low as that in nearly all European cities —viz. 27 groschy per cub.m. (equivalent to 3s. 6d. per 1000 c.ft.). This price seems likely to remain unaltered in the near future, in spite of the large fall in price of residuals in 1930. The losses incurred as a result of unfavourable trade conditions have been easily covered by the economies effected in costs of production and by the re-organization of labour.

The enthusiastic treatment of the question by the municipal authorities, and the warm collaboration of the technical and administrative staffs, as well as the hearty co-operation of the workmen, contributed very largely towards the successful execution of the programme. And, finally, the capable and efficient participation of a large number of important firms has contributed largely to the successful realization of this important enterprise with Polish material and Polish personnel.

(Signed) Dir. Swierczewski.

The work has been carried out under the direction of the following engineers:

M. Czeslaw Swierczewski, Director of the Warsaw Municipal Gas Department.

M. Stefan Torzewski, Vice-Director of the Warsaw Municipal Gas Department and Director of the Chemical Works.

M. Jan Lange, Engineer and Manager of the Warsaw Municipal Gas-Works.

M. Kaziwierz Mikolajczyk, Constructional Engineer.

M. Stanslaw Tor, former Vice-Director, particularly in connection with special services relating to the organization of labour.

The Reconstructed Works.

The carbonizing plant constructed by Messrs. West's Gas Improvement Company consists of 6 settings each of 8 retorts—that is, a total of 48 retorts—with a nominal daily capacity of 120,000 cub.m. (4,200,000 c.ft.) and a nominal carbonizing capacity of 200 tons daily of Upper Silesian coal. In practice, during the first year of operation, the daily capacity realized has been 140,000 cub.m. (4,900,000 c.ft.).

The retorts and their setting are of the standard Glover-West design. The crude gas from the several collecting mains unites in a foul main of 700 mm. diameter, which is equipped with a retort house governor to ensure uniform pressure conditions in the retorts. Two pumps placed at one end of the retort house are arranged to supply tar and liquor from the storage tank into which the condensates flow from the collecting mains back to the mains for flushing purposes.

Two retorts are specially arranged and separately connected to an auxiliary plant, so that they can be used as a test plant for coals.

The waste-heat recovery plant consists of two horizontal, induced-draught, fire-tube boilers of the standard Spencer-Bonecourt design. These boilers supply steam to the retorts, to the engines driving the induced-draught fans, and to all the pumps in the retort house, with a substantial surplus for general works purposes.

The whole installation is fully equipped with instruments for the measurement of temperatures and pressures throughout the gas-making and steam-raising apparatus.

The retort house is supplied with coal direct from wagons discharged by mechanically operated tipping machines each actuated by a 25-h.p. electric motor, and capable of discharging a loaded coal wagon of 20 tons capacity in 3 minutes. The coal as discharged passes to receiving hoppers and thence to one of the two breakers. These are built to West's 4-roll designs with two sets of heavy cast steel claws which reduce the coal in two stages to pieces not exceeding 50 mm. (nearly 2 in.) at the rate of 60 tons per hour. The broken coal is conveyed, elevated, and distributed in the bunkers above the retorts by West's lip-bucket conveyors.

The retort bench is completely encircled by two of these conveyors, one of which is used for coal and the other for coke in the usual manner. Each conveyor has a capacity of 60 tons of coal and 35 tons of coke per hour. The coal bunkers above the retort bench are of about 400 tons capacity, or 48 hours' supply to the retorts when all are in operation.

The coke is discharged from the retorts in the usual standard manner, the extractors being actuated by a 4½-kw. electric motor with a steam engine as stand-by, into one or other of the conveyors, which delivers it to the coke screening plant, or the bunker for unscreened coke, or the hopper for producer feed, or that for retort feed.

The coke screen is of the revolving drum type with meshes for grading in three sizes, 0-20 mm. (0-¾ in.), 20-40 mm. (¾ in. to 1½ in.) and over 40 mm. (over 1½ in.). The bunker beneath the screen is constructed in reinforced concrete, and is divided in compartments for the several sizes of coke, all fitted with outlets for the filling of railway wagons and road vehicles. Unscreened coke is collected in a bunker with a capacity of over 24 hours' maximum make, fitted with a West's patent automatic skip-filler for the service of the crane. The same crane is arranged to recover coke from the yard store and return it to the screens for grading. Coke to the producers and retorts is transported on overhead runways suitably arranged above the several feeding points.

The two electric cranes for the transport of coal and coke to and from the yard stores are designed to run on ferro-concrete gantries. The working radius of the coal crane is 15 m. (50 ft.) and the lifting capacity 5 tons gross (2½ tons net), while the figures for the coke crane are 16 m. (52 ft.) and 2½ tons gross and 1 ton net. Each crane is equipped with three motors for lifting, slewing, and travelling respectively. The gantries consist of ferro-concrete "bridges," 7 m. (23 ft.) above the yard level, 45 m. (148 ft.) long for the coke store, and 90 m. (295 ft.) for the coal, enabling 8000 tons of coal and 15,000 tons of coke to be stored.

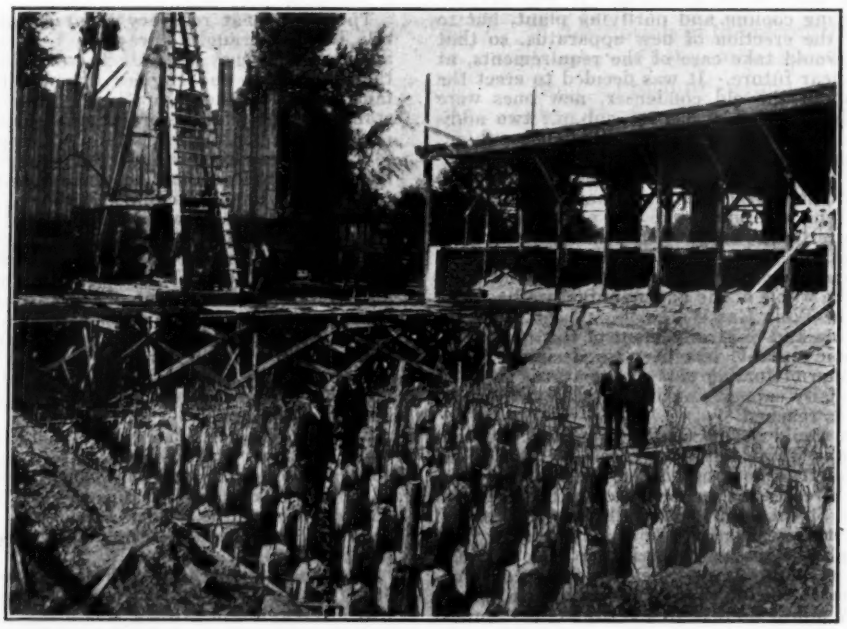
The retort house building consists of a steel-framed structure, filled in with panels of concrete blocks. The roof is covered with "Eternit" tiles. Ventilation is attained by the usual perforation of the panels and by a fixed ventilation opening at the apex of the roof. Access to the various parts of the retort house building and to the operating platforms and stages is obtained by staircases and gangways, in addition to the electrically operated lift, the cage of which is 1·85 m. square (6 ft.). It is capable of raising net loads up to 750 kg. (about 15 cwt.).

Foundations.

The coal receiving hopper and coal breaker pit were constructed by the "Caisson" method, on account of the soft nature of the subsoil. The effective depth of the pit is 9·23 m. (30 ft.).

The construction of foundations at these gas-works was attended with considerable difficulties, and, therefore, before commencing the work, numerous tests were carried out. Test holes were made on the building site, showing that at a depth of from 3·80 to 6·90 m. (12 to 23 ft.), a layer of loam combined with peat and a large amount of decayed vegetable matter were found. Underneath this peat-loam, grey-coloured marls were found, and, below these, compact sandy marls and loam with, finally, at a depth of about 10 m. (33 ft.), water-logged sand, small and large grained, containing a little loam of a grey olive colour. Underground water is found at a depth of about 2·5 m. (8 ft.).

The loads carried by the steel construction of the building and the stanchions of the retort bench are transferred to a reinforced concrete raft 1 m. in thickness (3 ft. 3⅜ in.),



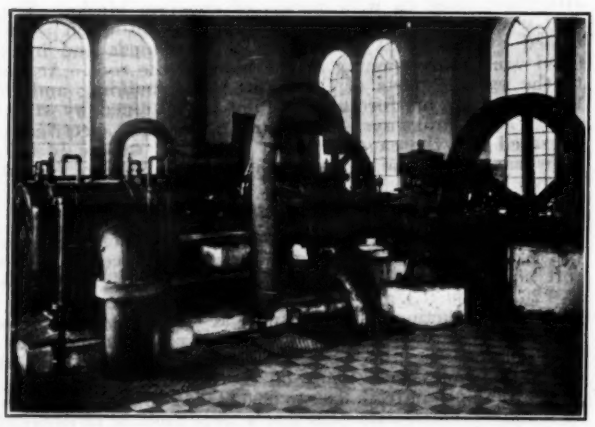
PILED FOUNDATIONS FOR GLOVER-WEST RETORT HOUSE, WOLA GAS-WORKS.

supported upon reinforced concrete piles 30 by 30 cm. (about 12 in. square) driven to a predetermined "set," from 1 to 1·3 m. (3 ft. 3⅜ in. to 4 ft. 4 in.) apart. The loads on the raft vary considerably at different points, and under some of the stanchions amount to as much as 200 tons. The disposition of the reinforcement and of the piles is varied to suit the disposition of the loads over the area of the raft.

The coke hoppers and screening plants immediately adjacent to the retort house are supported on reinforced concrete stanchions. These stanchions rest on a continuous reinforced concrete beam. The total load, amounting to approximately 1340 tons, is transferred to 84 reinforced concrete piles. The crane gantries are also supported on reinforced concrete foundations, each reinforced concrete stanchion resting upon a set of 4 piles, connected by ribs, 40 by 100 cm., supported in the middle on one pile. The load on each set of 9 piles is approximately 140 tons.

Reconstruction of Existing Settings.

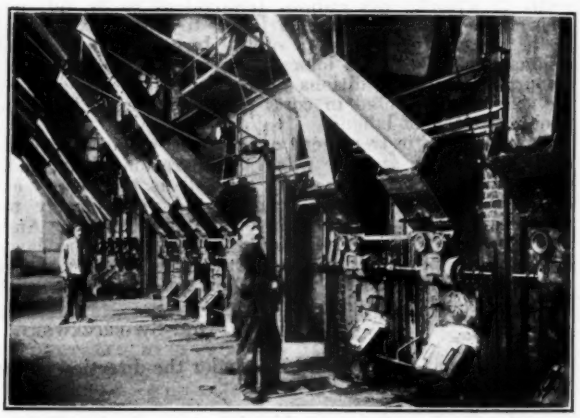
The transfer of one bench of five settings of vertical retorts from No. 1 to No. 2 retort house, necessitated by the failure of the foundations in No. 1 house and justified by the fact that the refractory materials and retort fittings were still in good condition, was commenced in 1923



Gas Compressors at the Wola Works.

and completed in 1924. The rebuilt settings were put into operation in 1926.

The transfer of the second bench of five settings from No. 1 to No. 2 retort house was begun in 1926. In this case, however, the type of the settings was considerably modified. Each row of three retorts was run into one chamber extending across the setting, increasing the actual capacity of the settings by 20 p.ct. The whole of the refractories used in this reconstruction are of local origin, and the work is now so nearly completed that during the



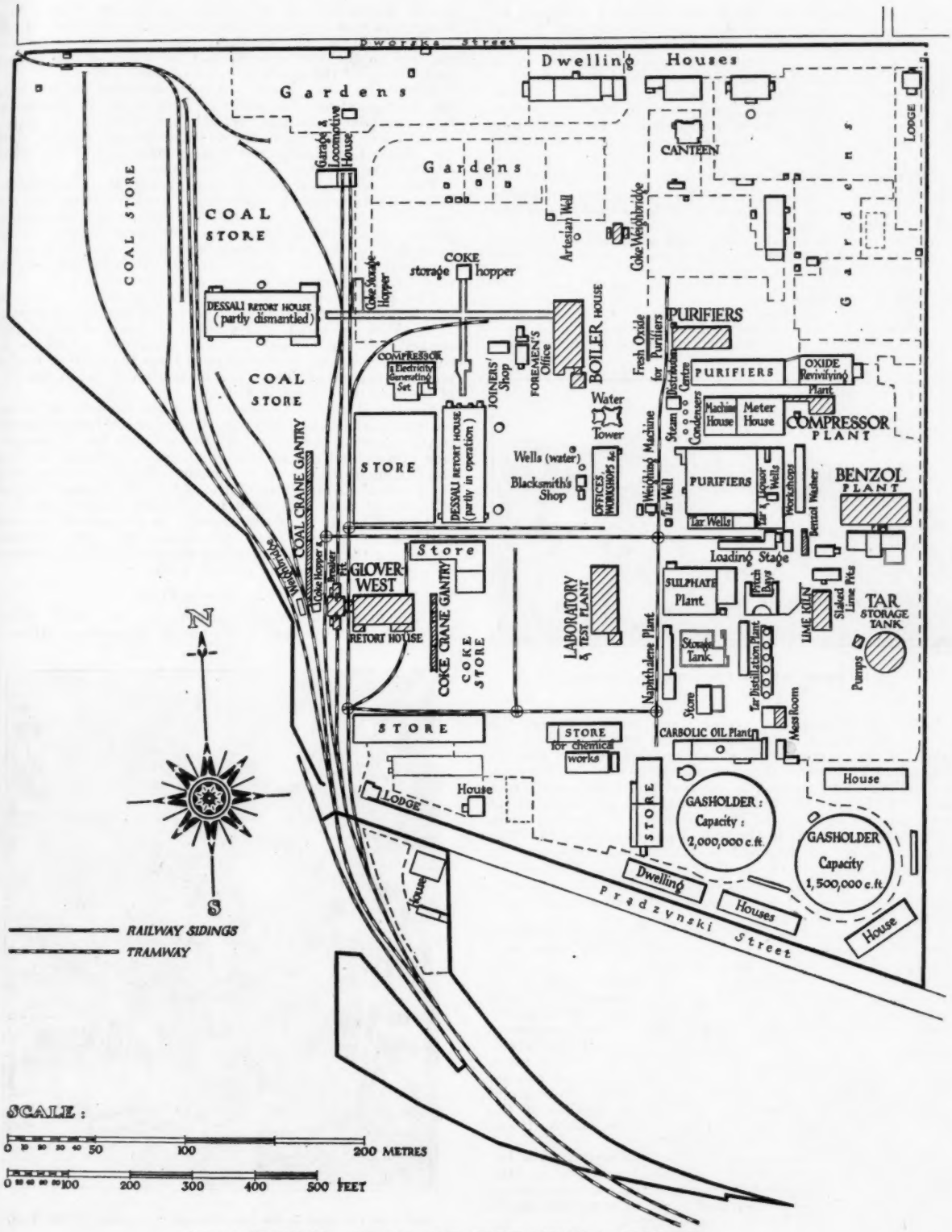
Water-Tube Works Boilers with Mechanical Stokers, Wola Gas-Works.

winter of 1931-32 these settings will in all probability be put into operation.

Condensing and Purifying Apparatus.

The apparatus for cooling and purifying the gas at the Wola Gas-Works was, generally speaking, very old, the last reconstruction having been made as far back as 1904. It consisted of three sets of apparatus of the same type working in parallel; each of the first two, dating from 1888 and 1895, was designed for a nominal daily capacity of 30,000 cub.m., while the third, built in 1904, is of double that capacity, so that the total nominal capacity of the old apparatus was 120,000 cub.m. Each of these sets included the following pieces of apparatus, placed in the order mentioned: Annular condenser; exhauster with by-pass governor; tar extractor; rotary cyanide washer; water-cooled condenser; rotary ammonia washer; purifiers (four main boxes and one catch box); and station meter.

When the horizontal retort settings were put out of operation and manufacture was changed over to vertical retorts, cyanide washing was found to be unnecessary. At the same time, the water condensers were transferred to the vacuum side following the annular condensers. When the capacity of the carbonizing plant at Wola was increased to 262,000 cub.m. per day on the installation of the Glover-West vertical retorts, corresponding increases



GENERAL PLAN OF THE WOLA WORKS.

had to be carried out in the auxiliary apparatus. Inquiries were issued to Polish firms, who were, however, permitted to work in collaboration with foreign designers, on the following basis:

(1) The capacity of the new group of apparatus was determined by the nominal capacity of the Glover-West vertical retort house—viz., 120,000 cub.m. per day.
(2) All the old condensers, both air and water, were to be dismantled, and the space thus made available was to be used for the accommodation of the new apparatus, with the exception of the condensers and purifiers.
(3) The new condensers, of a daily capacity of 300,000 cub.m. (10,600,000 c.ft.), were to be placed in the open air in the position formerly occupied by the old boiler house.
(4) The purifiers were also to be placed in the open air.
(5) The plant was to be supplied, as far as possible, by Polish firms and built from Polish material.

The work was divided between two Polish firms on these conditions, with the exception of the station meter, which was supplied by Messrs. La Cia pour la Fabrication des Compteurs, of Paris. The erection and re-arrangement of the new and the old plant began in the autumn of 1929 and was completed in May, 1930. The connections between the new apparatus and the old were arranged in such a manner that it was possible to work partly with the old and partly with the new apparatus.

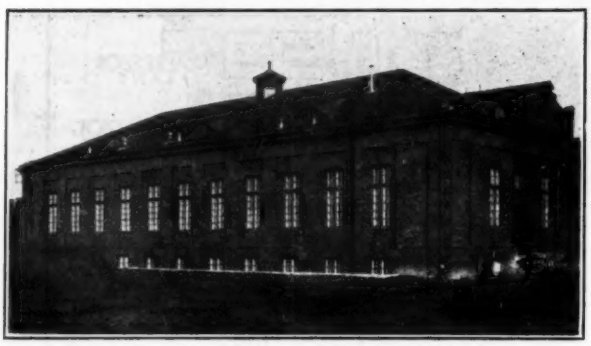
The plan of the works here reproduced shows the rather

complicated connections which were rendered necessary by these requirements. It is very creditable to all the engineers engaged on this works that, in spite of the manifest difficulties, no interruption whatever was necessary in the production of gas during the progress of the work.

The purifier boxes are constructed in mild-steel plates. Fears expressed in certain quarters as to the corrosion of the sheets by sulphur were considered to be groundless, provided that a suitable preservative covering was applied to the internal surfaces of the boxes.

The whole apparatus consists of the following items:

(*a*) Four water-tube condensers, of a total capacity of 300,000 cub.m. per day, each condenser giving a total cooling area of 3000 sq.m. (32,300 sq. ft.).
(*b*) Two multi-blade exhausters, each of a daily capacity of 150,000 cub.m. (5,300,000 c.ft.), driven by a single-cylinder steam engine, direct coupled, with two by-pass governors.
(*c*) Two tar extractors, each for a daily capacity of 120,000 cub.m. (4,200,000 c.ft.).
(*d*) Two static washers for ammonia filled with raschig rings, of a total daily capacity of 120,000 cub.m.
(*e*) All necessary gas and tar connections, valves, and fittings.



Laboratory and Test Plant, Wola Gas-Works.

In the condensers, the cooling water passes through the tubes from bottom to top and the gas passes between the tubes in the opposite direction on the counter-current principle. The condensers are placed in one row between two underground mains leading foul gas from each retort house to the exhauster house, enabling any number of condensers to be brought into operation, depending upon the production of gas in the individual retort houses. The connections are so designed that the condensers may be operated in series, or in parallel, as required. The cooling water, after passing through the condensers, attains a temperature of about 65° C. and is utilized as feed water for the steam boilers.

The exhausters are of the well-known rotary 4-bladed type, the vacuum and pressure sides being connected through an automatic by-pass governor.

The first piece of apparatus on the pressure side is the P. and A. tar extractor. The gas then passes to the ammonia washer, passing first through weak ammoniacal liquor and then through clean water. Each ammonia washer consists of a vertical cylindrical shell of steel plate, closed at the top and at the bottom. This shell is fitted midway with two perforated plates on which rest raschig rings upon which water and liquor is sprayed by special apparatus placed at the top and at the middle of the washer. The connections for the washers enable them, too, to be operated in series or in parallel.

All the apparatus is grouped into two series, with by-pass arrangements to enable individual units to be connected from one series to the other, while connections and by-passes enable each individual piece of apparatus to be put out of operation for cleaning or repair.

The purifiers consist of four boxes 7 m. by 8 m. by 4·2 m. deep (23 ft. by 26 ft. by 14 ft.) designed for a nominal daily capacity of 120,000 cub.m. (4,200,000 c.ft.). Each box contains eight layers of "oxide," each 350 mm. (1 ft.) thick, placed on wooden grids, the total volume of oxide in the four boxes being 640 cub.m. (22,600 c.ft.). The gas passing to the boxes is divided into four streams, each passing through two layers of oxide. Each box is equipped, in addition to the usual three-way valves for inlet and outlet, with two valves for changing the direction of the gas within the box. This change is repeated regularly at intervals of several days, ensuring a complete saturation of the oxide with sulphur before the boxes are emptied.

The purifier boxes are placed on steel supports at a height of 3·1 m. (10 ft.) above the ground level. They are enclosed up to the top edge of the boxes by a steel framework filled in with half-brick panelling, so that the space below the boxes can be heated during the winter to a temperature of about 15° C. to ensure the chemical activity of the oxide in cold weather. Only the top covers are exposed to the atmosphere, and these are insulated with cork lining on the inside to prevent loss of heat.

Above the boxes there is a hand-operated bridge crane for manipulating the covers. The oxide is discharged from the boxes through vertical pipes with sealed bottom covers, into electrically-driven side-tipping wagons which are themselves discharged into a band conveyor, which delivers the oxide to railway wagons.

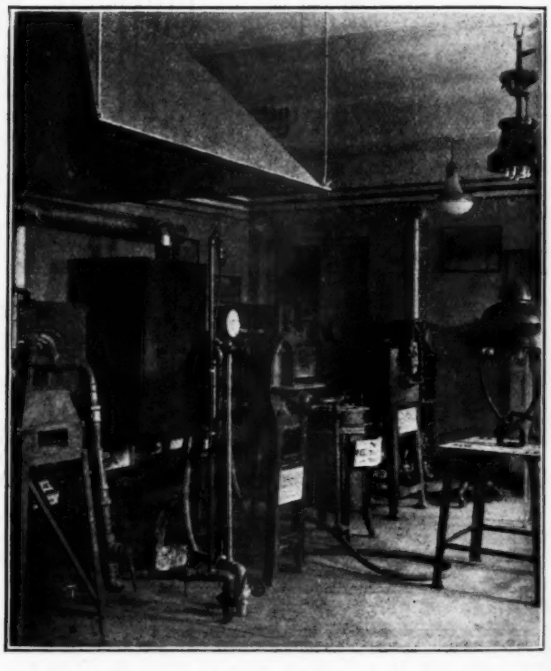
The same wagons and band conveyor are also used for filling the boxes with oxide from stock or from the railway. The conveyor feeds the oxide into a receiving hopper placed outside the building at a convenient height, whence it is fed to the side-tipping wagons. The lid-crane is equipped with an electrically-driven winch for hoisting the wagons to the level of the top of the boxes.

The station meter is of the Connersville rotary type, which occupies very little space (2·250 m. by 1·250 m. = 7 ft. 4½ in. by 4 ft.). This meter is designed for a daily capacity of 170,000 cub.m. (6 million c.ft.), and an accuracy of ± 1 p.ct. over a range of from 10 to 150 p.ct. of its nominal capacity. This type of station meter is the first of its kind to be used in Poland.

Finally, it should be stated that the lay-out of the apparatus has been planned with a view to the future increase in the capacity of the works. Room is left for the installation of a second row of four condensers, bringing the total condensing capacity up to 600,000 cub.m. per day, while the gradual dismantling of the old purifiers, and the substitution of new, will result in a further increase of about half-a-million cub.m. daily capacity in the present premises without the necessity of constructing any new buildings, except for the next set of purifiers, which will be arranged as a continuation of the present plant.

Central Boiler Plant.

The central boiler house contains four water-tube boilers of the Bormann-Szwede type, having a heating surface of



Industrial Furnaces in the Experimental Laboratory at the Wola Gas-Works.

250 sq.m. each (2691 sq.ft.) with grates on the Kojusa system, adapted for the burning of breeze and small-size coke. Fuel is supplied to bunkers, placed above the boilers, by way of side-tipping wagons running on a bridge connecting the retort house with the boiler house. From the bunkers the fuel falls into the automatic device for feeding the fires, so that the only manual work in connection with the boilers is that of the removal of clinker from the fires.

The boilers are designed for a working pressure of 16 atmospheres (135 lbs. per sq. in.), with superheaters to raise the temperature of the steam to 300° C. There is also an economizer which may be put out of operation when exhaust steam from the pumps and steam turbines is available for heating the feed water. The grates require

forced draught, which is obtained by means of the four fans actuated by electric motor or steam turbine.

The boiler house is equipped with all necessary instruments to ensure a continuous control, including water meter, thermometers for water and steam, CO_2 recorders of the Ranarex type, steam recording meters for the control of the output of the new boilers, and of the consumption of steam in the various departments of the works.

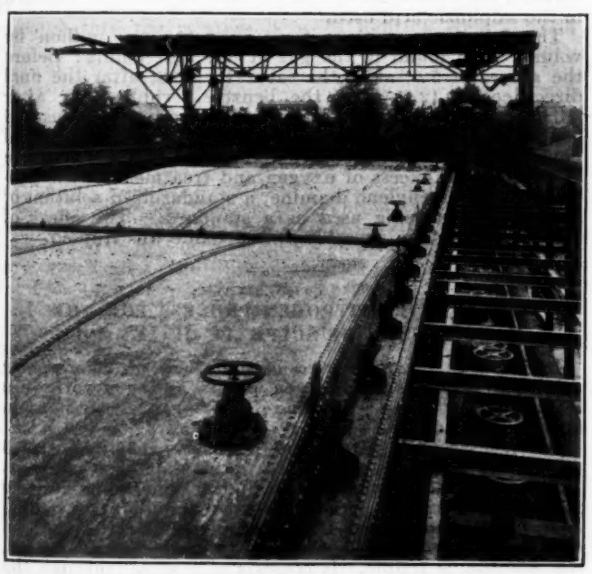
Booster Plant.

The booster plant, intended in the first place for the transference of gas from the Wola Works to the gasholder station at Ludna Street through a special main 200 mm. (8 in.) in diameter and 5500 m. (3·4 miles) in length, consists of two compressors having a capacity of 2200 cub.m. per hour (77,700 c.ft.). These compressors are built "tandem" with the steam engines actuating them, and are designed to raise the pressure of the gas to 1 atmosphere (14·7 lbs. per sq. in.) when the machines are making 140 r.p.m.

The high-pressure main between the two works is constructed in several sections, from which gas is taken to factories who use large quantities of gas for industrial purposes, the pressure being reduced as required by means of automatic regulators. The construction of this main and its equipment has produced a considerable improvement in this type of supply. The rapid increase in the consumption of gas for industrial purposes will, in all probability, compel the Municipality to enlarge the booster plant to such an extent as to enable the suburbs and similar resorts within a radius of 10 km. (about 6 miles) to be supplied with gas.

Station Governors.

The station governors at Ludna Street are placed in a new brick building containing three governors of the dry type, one having 600 mm. (24 in.) inlet and outlet diameters and supplying the upper town with gas, and the other, having 500 mm. (20 in.) inlet and outlet diameters, regulating the pressure of gas flowing to the lower part of the city (Praga). The third governor, of a size equal to the first, acts as a reserve. In addition to the governors there is a centrifugal booster, direct-coupled to a 10-kw. electric motor, for the purpose of increasing the pressure of gas to the governors when the gasholders are low. This booster set is also used for the production of the waves for the automatic lighting and extinguishing of street lamps.



Purifiers at the Wola Gas-Works.

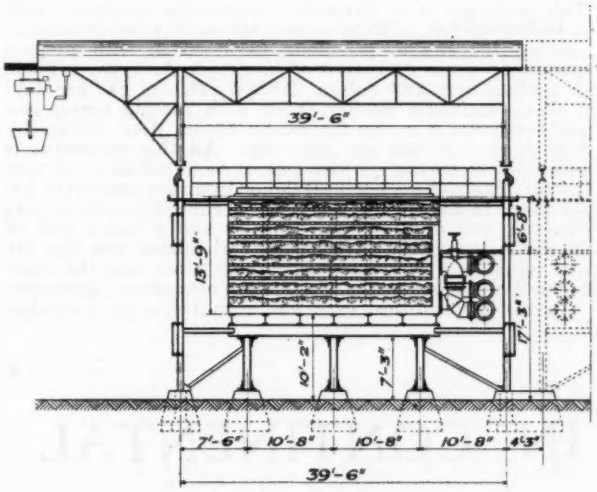
It is capable of producing a pressure of 250 mm. water (10 in.), measured as the difference between the inlet and outlet pressures.

The Chemical Works.

Extensions to the chemical plant were necessitated by the change-over arising out of the centralization of gas production. Ammonia liquor produced at the Ludna Street Works was, until recently, utilized for the production of sulphate in an old type of plant. In view of the fact that it was impossible to put the increased output of NH_3 on the market in the form of 25 p.ct. concentrated ammonia water, for the production of which the Wola Works already possessed sufficient plant, the plant was enlarged by the erection of apparatus for the production of sulphate of ammonia. This new plant enables the manufacture of sulphate to be increased to 8000 kg. per day.

The increased production of tar necessitated the construction of a ferro-concrete storage tank, capable of containing 2500 tons (about 550,000 gallons) of tar. A steam-driven pump has been put down to raise the tar direct to the railway tank wagons at the rate of 6 to 8 wagons per day—*i.e.*, about 100 tons of prepared tar. The number of storage tanks for oil obtained from the distillation of tar was increased by ten, having a total capacity of 350 tons.

The existing benzole plant, producing light oils from the distillation of tar, was enlarged by the erection of a new building containing apparatus for the recovery of



Purifiers at the Wola Gas-Works.

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Central Laboratory and Testing Station.

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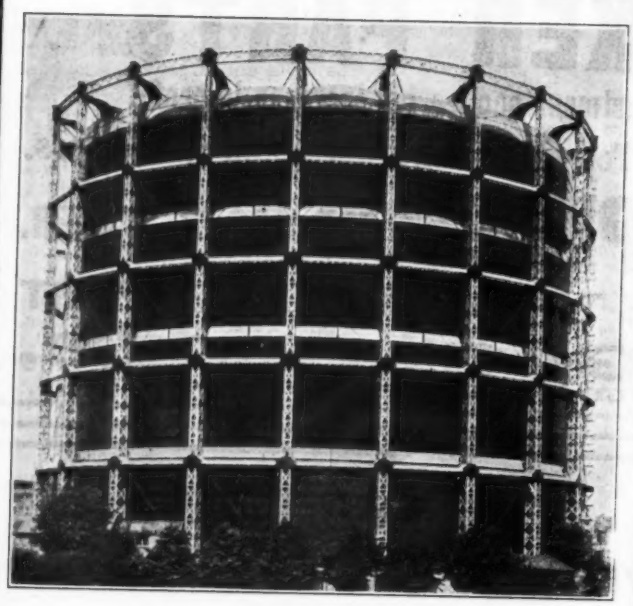

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forced draught, which is obtained by means of the four fans actuated by electric motor or steam turbine.

The boiler house is equipped with all necessary instruments to ensure a continuous control, including water meter, thermometers for water and steam, CO_2 recorders of the Ranarex type, steam recording meters for the control of the output of the new boilers, and of the consumption of steam in the various departments of the works.

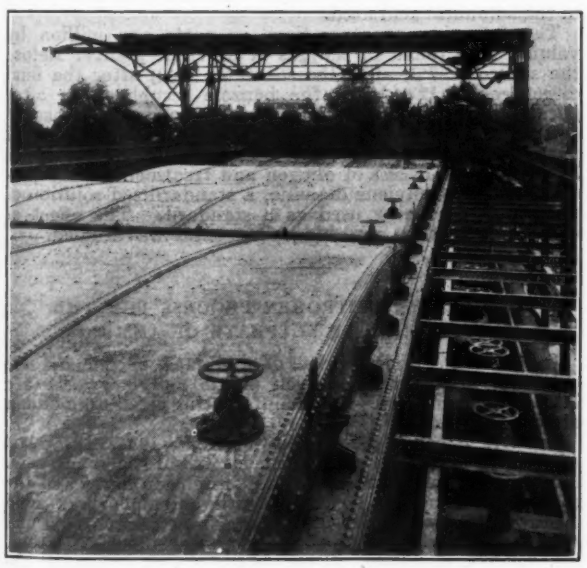
Booster Plant.

The booster plant, intended in the first place for the transference of gas from the Wola Works to the gasholder station at Ludna Street through a special main 200 mm. (8 in.) in diameter and 5500 m. (3·4 miles) in length, consists of two compressors having a capacity of 2200 cub.m. per hour (77,700 c.ft.). These compressors are built "tandem" with the steam engines actuating them, and are designed to raise the pressure of the gas to 1 atmosphere (14·7 lbs. per sq. in.) when the machines are making 140 r.p.m.

The high-pressure main between the two works is constructed in several sections, from which gas is taken to factories who use large quantities of gas for industrial purposes, the pressure being reduced as required by means of automatic regulators. The construction of this main and its equipment has produced a considerable improvement in this type of supply. The rapid increase in the consumption of gas for industrial purposes will, in all probability, compel the Municipality to enlarge the booster plant to such an extent as to enable the suburbs and similar resorts within a radius of 10 km. (about 6 miles) to be supplied with gas.

Station Governors.

The station governors at Ludna Street are placed in a new brick building containing three governors of the dry type, one having 600 mm. (24 in.) inlet and outlet diameters and supplying the upper town with gas, and the other, having 500 mm. (20 in.) inlet and outlet diameters, regulating the pressure of gas flowing to the lower part of the city (Praga). The third governor, of a size equal to the first, acts as a reserve. In addition to the governors there is a centrifugal booster, direct-coupled to a 10-kw. electric motor, for the purpose of increasing the pressure of gas to the governors when the gasholders are low. This booster set is also used for the production of the waves for the automatic lighting and extinguishing of street lamps.



Purifiers at the Wola Gas-Works.

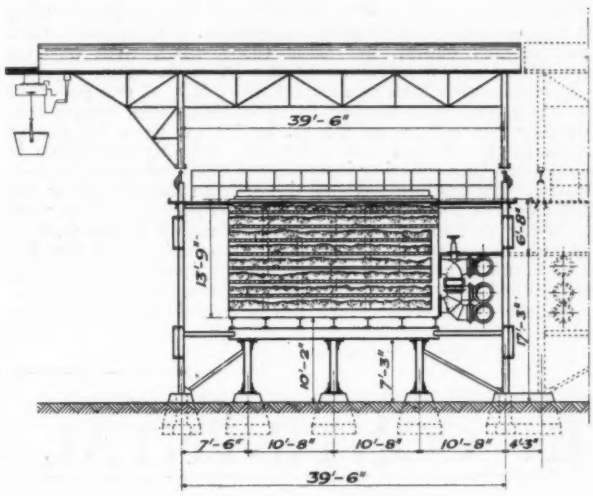
It is capable of producing a pressure of 250 mm. water (10 in.), measured as the difference between the inlet and outlet pressures.

The Chemical Works.

Extensions to the chemical plant were necessitated by the change-over arising out of the centralization of gas production. Ammonia liquor produced at the Ludna Street Works was, until recently, utilized for the production of sulphate in an old type of plant. In view of the fact that it was impossible to put the increased output of NH_3 on the market in the form of 25 p.ct. concentrated ammonia water, for the production of which the Wola Works already possessed sufficient plant, the plant was enlarged by the erection of apparatus for the production of sulphate of ammonia. This new plant enables the manufacture of sulphate to be increased to 8000 kg. per day.

The increased production of tar necessitated the construction of a ferro-concrete storage tank, capable of containing 2500 tons (about 550,000 gallons) of tar. A steam-driven pump has been put down to raise the tar direct to the railway tank wagons at the rate of 6 to 8 wagons per day—*i.e.*, about 100 tons of prepared tar. The number of storage tanks for oil obtained from the distillation of tar was increased by ten, having a total capacity of 350 tons.

The existing benzole plant, producing light oils from the distillation of tar, was enlarged by the erection of a new building containing apparatus for the recovery of



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This programme is to include a full survey and investigation of the gas coals available in the Polish coal field and a complete investigation of every method proposed for the utilization of these national resources to the best advan-

tage. The considerable deposits of brown coal in the country are also to be surveyed and their utilization is to be studied.

All this work is to be carried out in collaboration with existing scientific and educational institutions, and it is hoped that schemes will be worked out whereby students specializing in this branch of technology will spend at least one year in these laboratories.

The following is a short description of the building and apparatus erected and installed at the Wola Gas-Works.

The building occupies a plot of an area of about 500 sq.m. (5382 sq. ft.), of which about 120 sq.m. (1300 sq. ft.) is taken up by the testing station. The latter is a miniature gas-works with complete apparatus and accurate measuring instruments, taking gas from one of the continuously-operated Glover-West vertical retorts, equal to a capacity of about 4 tons of coal per day, or from one section of similar capacity of the intermittent verticals. This crude gas is let through a water-tube condenser with a cooling surface of 40·89 sq.m. (440 sq. ft.); an exhauster, passing 100 cub.m. per hour (3500 c.ft.), with by-pass governor; a tar extractor of the P. & A. type, capable of dealing with 2500 cub.m. (88,290 c.ft.), of gas per day; a static ammonia washer fitted with raschig rings; two purifier boxes 3 m. by 2·5 m. by 1·5 m. deep (10 ft. by 8 ft. by 5 ft.); and one aspirator. All this apparatus is connected to measuring instruments mounted on a common board. Tar and ammoniacal liquor from the apparatus are led away to a separator of 3 cub.m. capacity, with outlets to a tar well of 10 cub.m. capacity and a liquor well of 20 cub.m. capacity. After each carbonizing test the tar and liquor can be run away through pipes into the main tar well of the gas-works without the necessity of pumping.

In the laboratories, care has been taken to centralize the whole of the work formerly spread over the several laboratories of the gas-works, chemical works, and of the Municipal Inspection Department. There are three large rooms on the ground floor for chemical work, as well as a balance room, library, manager's room, assistants' room, cleaning room, and stores for spare apparatus. A special room for analytical work is equipped with apparatus heated by electricity, such as combustion furnaces, water baths, dryers, &c. There are four balances in the balance room, one of which is of a very recent design, for extra rapid weighing. The library already contains about 1300 volumes of technical books and journals. In the basement there are three rooms for calorimetry and gas analysis, including not only standard calorimeters, but three automatic recording instruments to show the calorific value of the gas, two before benzole extraction and one for the debenzolized gas as supplied to the city. The remainder of the basement contains a laboratory for thermal experiments, examining apparatus for the use and application of gas to domestic and industrial purposes, and an extensive laboratory for the examination of refractory materials. In the latter department apparatus for cutting and examining of thin sections and slides by microphotography is installed, together with several types of photometer, are accommodated in the same department.

Finally, there is a room set aside for a mechanical workshop for precision instruments.

It will be seen from the foregoing description that the equipment of this new department of the Gas Undertaking has been conceived on lines commensurate with the most modern requirements of the gas and fuel industries, and it is anticipated that the work done in this building will be of immense benefit not only to the Gas Department of Warsaw, but to the Polish Gas Industry as a whole.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

CALCULATION OF THE HEAT LOST THROUGH FURNACE WALLS.

E. Maase in "Feuerfest," 1931, 7, 97-102 (July), discusses the loss of heat through furnace walls and presents graphs by use of which an approximate estimate of the heat loss may be obtained.

The heat passing by conduction through the walls is dissipated to the external air by radiation and convection. The heat loss is a function of the temperature of the outer wall of the furnace. Use is made of the relationship

$$Tw = Ti - \frac{d}{k} Q$$

where Tw is the temperature of the outer wall, Ti the temperature in the interior of the furnace, d the thickness of the furnace wall, k the thermal conductivity of the bricks, and Q the heat lost per unit area of the outer wall per unit time. T, d, k, and Q must be in self-consistent units.

For a particular temperature of the external air, there is a fixed relationship between Tw and Q. A graph enables these values to be found for any values of Ti and $\frac{d}{k}$ and is based on Nusselt's work. Tables are given showing the conductivity of various types of refractory materials according to recent German determinations, and examples are given showing the effect of the porosity of the bricks on their thermal conductivity. A further graph shows the heat loss from and the surface temperature of furnaces having walls of various thicknesses.

The effect of the permeability of the walls on the heat lost is also considered. This loss is proportional to the permeability of the bricks and to the difference in pressure inside and outside the furnace. A graph enables the heat loss due to permeability to be obtained for various wall thicknesses and various furnace temperatures per unit difference of pressure for bricks having an assumed average permeability.

THE OCCURRENCE OF NITRIC OXIDE IN COAL GAS.

Nitric oxide may be present in coke oven gas due to infiltration of waste gas through the walls owing to a strong pull on the ovens. According to H. A. J. Pieters, "Brennstoff-Chemie," 1931, 12, 285-6 (Aug. 1), the content of nitric oxide may increase after the gas has passed through the saturators due to presence of oxides of nitrogen in the sulphuric acid used.

The following concentrations in parts per million by volume were found in the gas at different points: Before the saturator 7·6; after the saturator 13·2; after the final direct cooler 12·0; after the benzole scrubber 4·3; after purification 1·7. These small concentrations were measured colorimetrically by Schuftan's method involving controlled partial conversion of the nitric oxide into nitrogen peroxide by addition of excess of oxygen and treatment of the product with *m*-phenylene diamine, a standardized solution of sodium nitrite being used as a standard. The effect of various reagents in absorbing nitric oxide was studied.

THE ELECTRO-NITROGEN PROCESS FOR THE MANUFACTURE OF SULPHATE OF AMMONIA.

In view of the low price of and lack of demand for ammonia products, coke oven plants and gas-works are interested in processes for manufacturing fixed ammonium compounds cheaply.

B. Waeser in "Brennstoff-Chemie," 1931, 12, 293-5 (Aug. 1), describes the Tern electro-nitrogen process. Sulphur dioxide is oxidized in a high-tension flame and the resulting trioxide is combined with ammonia in a Feld electrostatic separator. Oxides of nitrogen are formed and serve as catalysts. The plant, according to French Patent, No. 650,684, is simple. It consists of a vessel through the walls of which pass two silica tubes opposite to each other. These are provided with perforated insulated discs for air admission and central Silit protecting covers for the iron electrodes. Each electrode has, at its end, a non-conducting plate of quartz, slate, or other suitable material. The strength of the current and the distance between the electrodes are adjusted so that the flame burns quietly between the plates and blue or crackling discharges are avoided. The gas to be oxidized is passed, with steam, into this vessel and issues into the electrostatic separator into which ammonia is passed. Ammonium sulphate is deposited in a dry state, the voltage in the separator being 60,000 volts.

It is advantageous to keep the silica tubes and the oxidation chamber, which is under pressure, hot. The entering air becomes activated and oxides of nitrogen are formed and are adsorbed onto the non-conducting plates so that

they act as catalysts. As soon as the flame burns quietly, sulphur dioxide is admitted.

The first installation was erected in the gas-works at Swinemund, and the good results induced the Thuringian Gas Company to construct a large plant of an annual capacity of 530 million c.ft. at the Engelsdorf works at Leipzig. Ammonia liquor and spent oxide are used as raw materials, the former being distilled and the latter roasted. Without purchase of sulphuric acid and without concentration, it is possible to make loose crystals of sulphate of ammonia. The power consumption is so small that profit is much greater than when sulphuric acid is used. At the same time, the process is easily run and is cleanly.

The plants projected up to the end of 1929 had an annual capacity of 40,000 tons of sulphate.

The process works best with dilute sulphurous gases containing 0·5-1·5 p.ct. of sulphur dioxide by volume, the conversion being about 98 p.ct. If stress is not laid on production of a pure salt, the ammonia need not be freed from carbon dioxide.

Apparently, the oxides of nitrogen do not appear in the sulphate and are possibly merely intermediate products.

THE ARTIFICIAL LIGHTING OF SCHOOLS

Report of the Sub-Committee appointed by the Technical Committee of the Illuminating Engineering Society in 1930

The Committee consisted of Mr. A. Blok (Chairman); Mr. J. S. Dow (ex-officio); Mr. W. J. Jones; Dr. A. H. Levy; Mr. E. L. Oughton; Mr. T. E. Ritchie and Mr. P. J. Waldram (representing the Illuminating Engineering Society); Mr. J. Swarbrick (representing the Royal Institute of British Architects); Dr. Elwin H. T. Nash (representing the Medical Officers of Schools Association); Mr. J. C. Buckley (representing the London Teachers' Association); and Dr. R. J. Lythgoe. The following is their report:

In view of the fuller knowledge in the science of illumination that has been attained, and the technical advance that has taken place since 1913, the Sub-Committee was requested to undertake a revision of the Report of the Joint Committee on the Artificial Lighting of Schools published in that year.* As a preliminary to such revision, the Sub-Committee undertook a study of the existing regulations, codes, and literature bearing on this subject. A questionnaire was also prepared and circulated to educational authorities throughout Great Britain, with the object of ascertaining particulars of rules and regulations in force bearing on the lighting of schoolrooms.

From these inquiries it was concluded that few if any precise regulations of this kind are at present in existence. It also appeared that no results of satisfactory scientific research into the relation between lighting conditions in schools and the well-being or performance of work of pupils, such as would form a necessary basis for standards and regulations, had been published. A comprehensive inquiry of this description, which the Sub-Committee is now initiating, may occupy a considerable time, and the possibility of forming definite conclusions as a result cannot yet be judged. But it has been suggested that, pending the result of this inquiry, a series of recommendations based on general experience and on observations of what is considered by the Sub-Committee to be good modern practice would be of utility, especially as a guide to lighting methods in new schools. The following series of recommendations has been prepared solely on this basis.

In regard to the recommended values of illumination specified, it should be clearly understood that these are minima which, in some circumstances, may be advantageously exceeded in practice. Furthermore, as no system of lighting is completely uniform the minimum illumination will necessarily be exceeded in certain parts of a schoolroom. Finally, it should also be remembered that there are at least three factors which cause a progressive diminution in the illumination of a given room—viz., (*i*) the accumulation of dust or dirt on the glassware of lighting fittings, (*ii*) depreciation of the reflecting value of the walls and ceiling due to the accumulation of dust or dirt, and (*iii*) deterioration of the illuminants themselves, whether electric lamps or gas mantles. Experience shows that these causes may reduce the illumination by 20 or 30 p.ct. of its initial value in six weeks if local conditions are sufficiently unfavourable. These factors of depreciation should, therefore, be taken into account when the installation is initially planned, in order that the minimum values of illumination recommended below may be obtained when the depreciating conditions are at their worst.

Recommendations.

Subject to the foregoing remarks the recommendations of the Sub-Committee are as follows:

I. Illumination.

The minimum illumination provided should be:

(1) *On desks and tables in schoolrooms*, measured on the desk, table, or other surface on which the work is done, (*a*) 5 foot-candles† for ordinary clerical work (reading and writing) and (*b*) 8 foot-candles for special work (in art classes, drawing offices, workshops, and sewing rooms where dark materials may be used).

(2) *On blackboards*, measured on the plane of the board, 60 p.ct. in excess of the illumination measured on desks or tables.

(3) *In assembly rooms and recreation rooms.* 3 foot-candles measured in a horizontal plane 2 ft. 9 in. above the floor level.

(4) *General illumination.* Apart from the minimum values recommended above, in no part of any school building should the illumination be less than 1 foot-candle, this being measured, in the case of stairways, upon the tread surface of the stairs and in other places being measured in a horizontal plane 2 ft. 9 in. above the floor level.

II. Avoidance of Glare.

Great importance should be attached to avoidance of glare such as is liable to arise (*a*) from the display in classrooms of unscreened gas mantles or lamp filaments within the direct range of vision ("direct glare") or (*b*) from the reflection of light-sources in polished or glazed surfaces ("reflected glare").

With a view to avoiding direct glare it is recommended that:

(1) No incandescent surface or brightly illuminated reflector or similar surfaces forming part of lighting fittings should be visible to the eyes of teacher or pupils while carrying on their ordinary work, and sources of light should preferably be surrounded by a diffusing medium such that its average brightness does not exceed 5 candles per sq. in. of surface area.

(2) No source of light should be situated below a line drawn from a point on the back wall 3 ft. 6 in. above the floor to a point 4 ft. above the upper edge of the blackboard surface, unless it is completely screened from the eyes of pupils by an opaque screen. In the case of a room having a sloping or stepped floor rising away from the blackboard, the 3 ft. 6 in. is to be measured from the elevated floor surface at the end of the room remote from the blackboard.

(3) The fact that staircase lighting involves considerations of safety should be borne in mind. Special precautions should therefore be taken to avoid glare from sources of light used to illuminate stairways, especially as regards persons *descending* the stairs.

With a view to avoiding reflected glare it is recommended that:

(1) Special care should be devoted to (*a*) the selection of the blackboards, the surfaces of which should be maintained in a dark and matt condition, and (*b*) the positions of light-sources in relation to blackboards in order to avoid specular images of the sources in the line of sight.

(2) The surfaces of walls, ceilings, and, so far as possible, furniture, should be of such a surface texture

* "The Illuminating Engineer," July, 1913, pp. 364-366.

† A foot-candle may be defined as the illumination on a surface distant 1 ft. from a source of 1 candle-power and perpendicular to the direction from which the light is received.

that any considerable specular reflection is avoided (glazed and shiny surfaces above the dado are specially objectionable).

(3) So far as possible books intended for the use of children should be printed on paper that is free from glaze. The use of highly glazed paper for writing upon should also be avoided.

The use of lighting equipment of low surface brightness, as a means of diminishing direct glare, is also of value in reducing reflected glare, as the brightness of the reflected image is less.

Light-coloured surroundings, by diminishing the contrast between light-sources and their backgrounds, are helpful in reducing direct glare, and the diffusion of light by this means also aids in rendering reflected glare less evident.

III. Avoidance of Objectionable Shadows.

The number and position of lights should be so chosen that objectionable shadows cast by the body or by columns or other structural features of the room on the desk or other places where the work is done are avoided.

Such shadows are least evident when:

(1) The sources of light are surrounded by diffusing media such as extend the luminous surface and therefore give rise to soft shadows, and

(2) The walls and ceilings are light in colour, and thus serve as extended secondary sources of low brightness. The ceilings should preferably be white and the walls and all decorations above the dado should be light in tint.

In view of the importance of adequate lighting of stairways in the interest of safety, lights should be so arranged that shadows of risers on the treads are avoided.

IV. Positions of Light-Sources.

(1) *In Classrooms.* Classrooms approximately of the standard size (*i.e.*, about 480 sq. ft.) may conveniently be lighted efficiently by four suitable lighting units‡ distributed symmetrically above the desks, but supplementary illumination for the teacher's area and the blackboard by two additional units is sometimes desirable. With a view to avoiding glare, it is important that the lights be kept well out of the normal line of vision. Where practicable a height of suspension of not less than 10 ft. is to be desired. Special importance attaches to supplementary lights intended to illuminate the blackboard or the teacher's area, as these are more liable to come within the direct view of pupils, and because incorrect location is liable to give rise to troublesome reflected light from the blackboard surface. For these reasons it is desirable to make the height of suspension of such additional sources of light as great as possible, and to pay special attention to screening.

(2) *Stairways.* Light sources should be so placed that each flight of stairs is illuminated both from above and from below.

V. Depreciation and Maintenance.

As deposits of dust result in rapid diminution in the available illumination, it is expedient that all lamps and lighting fittings should be overhauled and cleaned at intervals of not more than one month. For general lighting modern forms of enclosed fittings which are less liable to suffer from the entrance of dust are to be preferred.

[Copies of the report will be sent to anyone interested by the Hon. Secretary of the Committee, Mr. J. S. Dow, 32, Victoria Street, London, S.W. 1.]

‡ See paragraphs II. (1) and V.

Continuous Carbonization : of Durham Coals :

Results in Glover-West Verticals at the Nine Elms Works of the Gas Light and Coke Company

[From "West's Gas."]

The carbonization of unscreened Durham coals constituted a problem in the earlier years of the development of continuous vertical retorts, but for many years now a considerable number of large and small installations of Glover-West vertical retorts in this country and abroad have dealt successfully with these coals. In the London area alone, installations constructed, to which these coals only are supplied, have an output of 25 million c.ft. per day.

A test of 28 days' duration conducted by the Gas Light and Coke Company was concluded last month in a large installation at their Nine Elms Station.

The usual mixture of sea-borne Durham gas coals was carbonized. Grading tests made on these coals prior to the tests now reported showed some 45 p.ct. of fines passing through ¼-in. mesh, and close upon 70 p.ct. passing through ½-in. mesh.

The average results for the whole period of the test were as follows:

	Results.
Coals carbonized per working retort per 24 hours, tons	4·37
Gas, calorific value, B.Th.U. per c.ft. gross	507·4
Make per ton, c.ft.	15,540
Therms per ton of coal carbonized	78·85
Therms per ton. (Inerts in the coal reduced to 8 p.ct.).	79·6
Fuel, p.ct., by weight of coal carbonized—	
Wet	13·7
Dry	13·6
Coke and breeze for sale, per ton of coal (dry), cwt.	11·49

Each of these results is better than the guarantee stipulated.

The retorts of the installation are of the "New Model" standard type with separate step-grate producer for each setting of eight retorts.

Waste-heat induced draught boilers are included in the plant, and the test results showed an average of 4·49 lbs. of steam from and at 212° Fahr. per lb. of dry fuel consumed in the producers, or 1236 lbs. of actual steam raised per ton of coal carbonized.

The steam used in the process was approximately 10·5 p.ct. of the weight of coal carbonized, leaving 1000 lbs. of actual steam per ton of coal carbonized for power generation and other purposes. This surplus is equal to 40-H.P. hours per ton of coal carbonized, on the basis of 25 lbs. of steam per horse-power per hour. W. G.

REVIEWS

THE COKE OVEN INDUSTRY OF 1931.*

The Year Book of the Coke Oven Managers' Association is now firmly established as a record of practical work and information, valuable to all who are in any way interested in coking practice; and the Editorial Committee of the Association are to be congratulated that in the present issue, as in previous issues, the usefulness of the book has been preserved by including only such matter as is considered likely to be of service.

As usual, the book contains useful information on the rules and membership of the Association, with lists of officials, past-presidents, &c. Full particulars are given of coke oven plants either in operation or under construction in Great Britain and in twenty-one other countries. More countries are included than in the last Edition, plants in Australia, Austria, Hungary, and Sweden being added this year.

The remainder of the work is devoted to the transactions of the meetings of the Midland and Northern Sections of the Association, full reports, with photographs and diagrams, being given of the various papers read; model answers to questions set in the City and Guilds of London Institute Examinations in Coke and Bye-Products Manufacture held this year; the British Standard Specification for tars (Nos. 1, 2, and 3) for road purposes; and also some tables and formulæ relating to high-pressure gas distribution.

Altogether this is a very useful volume, summarizing in a comprehensive manner another year's activities of our sister industry; and users of the book should find it fully as valuable as its predecessors.

* "The Year Book of the Coke Oven Managers' Association, 1931," printed, for private circulation only, by Benn Bros., Ltd., 154, Fleet Street, E.C. 4.

THE "JOURNAL" TECHNICAL RECORD

Which contains Full Reports of Meetings of Gas and Allied Associations

Irish Association of Gas Managers

PRESIDENTIAL ADDRESS BY MR. G. WALMSLEY

Annual Meeting in Londonderry, Aug. 11

I would like first to express my appreciation and thanks for the honour conferred in my election to the Presidency of the Irish Gas Managers' Association. I should also like to express thanks to my Chairman and Directors of the Londonderry Gas Company, without whose co-operation I could not have accepted.

As you will I hope be visiting the Undertaking of which I have charge later in the proceedings, I propose first to give a brief description of the works and plant. The works cover an area of about nine acres, and it is generally agreed the plant is well arranged and substantially built, for which credit is due to the foresight of my predecessor. Unfortunately, the actual site of the works, as regards getting our principal raw material, coal, on to the job, is far from ideal, being adjacent neither to the quays nor railways. This necessitates the carting of some 12,000 tons of coal per annum from the quays to the works, a distance of over a mile, and at a cost for carting alone of £1200 per annum. The cost of taking coal out of the boat at the quay and depositing it on the works costs no less than 4s. 5d. per ton, or £2600 per annum, representing nearly 4d. per 1000 c.ft. of gas sold.

In this connection it may not be out of place to raise the question as to the advisability of considering very carefully, when new capital expenditure is contemplated, whether the existing manufacturing station—probably the ideal and best available site 100 or even 50 years ago—is quite as ideal now, taking into account the change of transport—*i.e.*, from rail to road, which is being favoured in many cases at the present time—higher cost of transport both by rail and road, and, in the case of motor transport, higher imposts in the way of road taxation and petrol and oil duties. This is a question which I think concerns the medium and smaller works, particularly now the vertical retort has established itself as an adaptable and paying proposition for such works. In the event of changing over to either verticals or modern horizontal settings, involving expenditure representing a big proportion of the total capital of the Undertaking, it might be well to consider the scrapping of some of the auxiliary washing and purification plant and going on to an entirely new site, thereby saving annually in transport costs more than sufficient to pay the instalment and interest charges in replacing such auxiliary plant, together with the cost of connecting up to the existing distribution system.

Carbonizing Plant.

The existing carbonizing plant consists of 16 Glover-West "steaming" retorts (33 in. model) heated in units of two, served by three producers. These replaced installations of horizontal and inclined retorts. The original contract was for 12 retorts, in two beds of 6 retorts each, installed in 1924, and a further 4 retorts were added last year. The original 12 retorts are still making gas, each retort having already had a working life of over 2200 days, and their present condition warrants them continuing for some years yet before being rebuilt. Carbonizing both Yorkshire and Scotch coals at an average temperature in the combustion chambers of 2300° Fahr., the life of these retorts is, I think, well above the average.

Our method of "maintenance" has been to let one bed of 6 retorts down each summer, reline the producer, and wash down and "podge" each retort thoroughly. In this way each retort was thoroughly examined, and only latterly have some been occasionally repaired by the insertion of a few silica segments where required. Although, perhaps, contrary to general practice, the letting down of each setting at least every two years and thoroughly repairing any visible defects has in our case been well justified, the maintenance costs of the retorts over the whole period of seven years averaging only £49 per year.

The coal carbonized was 74,900 tons over the whole period of seven years, and it is very probable that considerably over 100,000 tons will be carbonized by these 12 retorts before they are re-set.

Waste-Heat Boilers.

We have two waste-heat boilers for utilizing the heat of the waste gases after leaving the setting, the one recently installed being a Spencer-Bonecourt vertical fire tube type, natural draught and guaranteed to evaporate 600 lbs. of water per hour at a pressure of 120 lbs. per sq. in. In this connection it is interesting to note that over the period Oct. 15, 1930, to Jan. 26, 1931, an average of 2100 gallons of water per day was evaporated. This is well over the guarantee figure, but it should be mentioned that special arrangements were made at the time of placing the contract for the additional four retorts so that the surplus waste gases from the existing 12 retorts could be passed through the new boiler if required. This, as events have turned out, proved very successful, and the boiler is working constantly up to its maximum efficiency.

There is nothing outstanding regarding the coal breakers, elevators, and conveyors, which are operated by an 80-H.P. Tangye gas engine and two 12-H.P. motors. The condensers are of Holmes twin water cooled type, preceded by a P. and A. tar extractor, with provision left for another extractor if required.

There are two Livesey washers and one rotary scrubber, which is followed by a third washer, which can be adapted for debenzolizing purposes. The washers are all under cover erected in one house, which also contains the pumps used on the works for varied purposes, the exhaust steam from these being utilized for heating the feed water to the boilers.

There are six concrete purifiers, 30 ft. by 16 ft. by 6 ft. deep, each containing about 60 tons of "bog ore," obtained from the surrounding districts in County Donegal.

Gasholders.

There are two single lift coal gasholders, erected about 1865, contained in brick and puddle tanks 102 ft. diameter by 22 ft. deep, each having a capacity of 150,000 c.ft., and it will thus be seen that with the exception of a small holder at the Waterside Works—now abandoned as a manufacturing station—and a small relief holder in connection with the carburetted water gas plant, the total storage capacity is now only 300,000 c.ft., with a maximum daily output of 762,000 c.ft. Although this capacity is admittedly very low, necessitating occasionally somewhat sleepless nights for the management, it must be admitted that with an annual output, as far as can be ascertained, of only about 40 million c.ft. when these holders were erected, the proportionate capital expenditure for storage then must have looked extremely high. I mention this as interesting, and, of course, indicative of the general levelling up of the daily load which has taken place during recent years by the diminution of the lighting load and the ever-increasing cooking and heating load, which is more evenly spread over the whole 24 hours.

In this connection it is also interesting to note that although our annual output has increased from 118 million c.ft. in 1922 to 176 million c.ft. in 1930, the storage problem was more acute ten years ago than it is now, and with the prospects of increased cooking and heating loads, and particularly a 24-hour gas-heated water and refrigerator load, the capital expenditure per 1000 c.ft. of gas sold as represented by holders will generally tend to decrease. I need

hardly say, however, that with an ever-increasing demand to meet, the question of erecting a new holder is at present under consideration.

Wise Use of Capital.

I do not wish it to be understood from the above remarks relating to the question of storage in regard to capital charges that I advocate leaving storage accommodation in such a position as to jeopardize the continuity of supply in the event of a serious breakdown in the manufacturing plant. My object is to point out that perhaps in some cases there is a tendency, particularly in smaller works, for capital to be sunk in what might be termed unremunerative plant, thus crippling expenditure on the sales and distribution side. The capital thus spent, in my opinion, might be more advantageously used in bringing gas prices down to a more competitive level where these are comparatively high, as may be the case in some small undertakings faced with Government aided electricity schemes, or quite an appreciable amount of this capital could perhaps be advantageously used in the opening of showrooms, launching of hire purchase and maintenance schemes, &c.

I would certainly say the time has come when in the majority of cases the old factor of 24 hours maximum day's output for storage should be revised, and capital thus released from " the base " put more advantageously into what may be termed the " front line " to meet the intensive electrical propaganda recently launched.

Other Works Plant.

The power house contains two Lancashire dynamos, 40 and 25 kilowatts respectively, direct coupled to 70 and 40 H.P. National gas engines, which provide current at 440 volts for driving the small coal elevators, boosters, hoist and pumps. There is also a small dynamo driven by a 6-H.P. National gas engine for providing light in the purifying and pump houses. The exhausters and boosting plant are also situated in the power house. The exhausters in duplicate are of Waller's make, of 65,000 c.ft. per hour capacity, direct coupled to two horizontal steam engines and fitted with steam governors, automatic by-pass, &c. The boosters, also by Waller's, are in duplicate and capable of dealing with 130,000 c.ft. per hour against a total pressure difference of 9 in. and rated at 2400 r.p.m. They are direct coupled to two enclosed 10-H.P. motors.

The sulphate of ammonia plant is a Wilton's 3 ton per day neutral plant, with a closed saturator and centrifugal drier complete with liquor sight feed, air compressor for acid, &c. The liquid ammonia plant was fully described in a paper I gave before the Association at Cork in 1927, and therefore I do not propose going into details here, but any interested in the matter will be able to see the plant in operation.

The carburetted water gas plant is complete with boilers, steam-driven blowers, exhausters, relief holder, meter, condensers, and purifiers, and at present is out of service, all the load being taken up by the vertical retort plant. A small auxiliary works lying across the river is also out of service, except for use as a distributing centre, all the gas now being delivered to that district by means of a 6-in. steel main across the bridge.

The works are also equipped with mechanics' shop, carpenters' and blacksmiths' shops, garage, and laboratory. The showroom is situated in the town, which will no doubt be superseded by larger and more central premises in the near future.

Progress of Gas in Ireland.

It is customary for the President of this Association to review generally the condition of the Gas Industry, and more particularly to survey the present and prospective position as it affects us in Ireland. I propose now to attempt this in the short time I have left at my disposal.

First let me state as authoritatively as my position warrants that, despite the depression in industry and the intensive political boosting of electricity, the Gas Industry in Ireland is still progressing. Taking the " Gas World " Year Book figures for 1931, we find that for the whole of the British Isles the gas made last year was 329,722 million c.ft., against 321,616,500,000 c.ft. for the previous year, which shows an increase of 8106 million c.ft., equivalent to 2·5 p.ct. Now taking the figures for Ireland alone, we find that the gas made was 8908 million c.ft., against 8681 million c.ft. for the previous year, showing an increase of 227 million c.ft., equivalent to 2·6 p.ct.

In the British Isles there were 278,000 more consumers than in the previous year, an increase of 2·8 p.ct., whereas in Ireland the increased number of consumers was 13,428, representing no less than 5 p.ct. increase over the previous year. It will thus be seen that the percentage increase in gas made was actually higher in Ireland than in the rest of the British Isles, and there was nearly double the percentage increase in the number of consumers. All this despite —or, should I say, because of—the highly advertised Shannon hydro-electric scheme, which was to electrify and revolutionize the country. From the recent revelations in the Dail it has certainly succeeded in doing the former if not the latter.

I have no intention or desire, however, to discuss the misfortunes of the Electricity Supply Board in connection with the Shannon scheme; indeed it was, I am sure, the sincere wish of all, including members of the gas profession, that the wishes of the promoters of the scheme should be eventually fulfilled and that it would be the means of developing the country and bringing new industries into the more remote parts of Ireland. To my mind, however, the scheme was unhappily devised on too large a scale for such a sparsely populated country, and as events have proved the existing lighting and power load is far from sufficient to provide the necessary revenue to justify the capital expenditure. This, of course, as our members in the Free State are painfully aware, necessitated the Electricity Supply Board going all out for the heating load and boosting their product as an economical fuel.

Use of Electricity as a Fuel.

There is no doubt that the recent developments in the efficiency of electricity as a lighting and power agent have led many people to expect there will be a corresponding advance in its efficiency as a fuel. Sir Francis Goodenough, whose invaluable services to our profession we all so gladly recognize, recently stated: " The great insuperable limitation of electricity as a source of heat and power is that a given quantity of electrical energy has its precise equivalent in heat or in mechanical energy. Convert a kilowatt-hour of electrical energy into heat and you can get 3412 B.Th.U. Convert it into mechanical energy, and if you have an electric motor of 100 p.ct. efficiency—which, of course, you have not—you can get 1¾ H.P. hour. Not all the scientists of all the ages can ever get you more than that, of either heat or power, from a kilowatt-hour of electrical energy, any more than they can get you out of a pound of butter more than sixteen ounces."

That electricity can develop as a fuel in the same way as it has undoubtedly done as a lighting agent is the unfounded belief on which is based so many hopes that are doomed to disappointment. We do not know the limit of efficiency of electricity as a lighting agent, but as a medium for the conveyance and production of heat it is strictly limited, and in Northern Ireland fatally so, because the great insuperable obstacle to the economical generation and utilization of heat in the form of electricity, is that there is no means of generating electrical energy in this Province other than by the conversion of the potential heat energy of coal into electrical energy, and that is a most wasteful process.

Electrical Developments in Northern Ireland.

With the results of the hydro-electric scheme in the Free State before them—where they have the advantage of utilizing the water power of the Shannon in lieu of coal—what will be the attitude of the Government of Northern Ireland, whose experts have turned down hydro-electric generation as impracticable with regard to future developments under their Electricity Supply Bill? So far as the electricity stations of Belfast and Londonderry are concerned, there is no doubt that these concerns are among the best managed and most economically run undertakings in the British Isles; but what will happen if under this scheme they are crippled with high capitalized distribution costs for developing the so-called " rural areas " in Northern Ireland?

According to the Bill, the Electricity Board, which has greater powers invested in it than those of the Central Electricity Board in Great Britain, has power, under certain conditions, to acquire undertakings already functioning in Northern Ireland. The Board has power to borrow the necessary capital and to issue stock, provision being made for a Government guarantee as to principal and interest of any such loans. In view of the Shannon hydro-electric scheme disclosures, it is to be hoped that any developments contemplated in Northern Ireland which necessitate such Government financial backing will be most carefully considered, and particularly those powers which refer to the compulsory acquisition of existing undertakings without regard to goodwill or compensation to the ratepayers for any loss they might incur in losing profits which had previously been applied in relief of the rates.

A recent statement made by Mr. H. F. Whysall, M.I.E.E., the Corporation Electrical Engineer in Belfast, is worth recording. He stated: " One must concede that the financial control of electricity supply undertakings has been up to the present time very wise and safe, and we must not, in our enthusiasm for development, ignore the advice of their financial officials in connection with our projects. Northern Ireland as a whole is not a rich field for electrical

development. It is sparsely populated. Rural electrification will be difficult on account of the comparative smallness of the farms, and the linen mills are difficult prospects, first on account of the state of trade, also on account of the prevalent conviction among mill owners and their engineers that the use of steam engines or steam turbines will always best meet their industrial steam requirements and give them electricity at less cost than it would be bought from a modern supply authority."

Gas and Electricity.

The future of the supply of heat, light, and power lies both with electricity and gas. Each has its own sphere, each has its own use, and no good purpose to the community can be served by expending money wastefully in the putting of one or the other to uneconomical use. In Norway, where electricity made from water power is available at a much lower price than in this country, new gas-works are still going up, and the use of gas for heating and cooking is rapidly developing.

The greatest consumption of gas per head of population is in the great cities of America, where the generation and use of electricity have been brought to a far more economical pitch than in this country; yet you find that in America the prosperity of gas undertakings keeps equal to or ahead of that of the electrical undertakings, although in many cases they are wiser in that country, in that they combine the two services in one public utility company and attain thereby greater economy of production of both gas and electricity.

The Gas Industry has done and is doing more than any other agency by its production of gas and coke—the two most economic smokeless fuels—to alleviate that great peril to health, smoke, with all its attendant evils. I would suggest to our members to concentrate more and more on the production of coke and its presentation to the public in a suitable form as a smokeless fuel.

Irish Tar for Irish Roads.

With regard to tar, most of the works in Ireland are, perforce, selling this product to the distiller, but the non-skid property of tar for the surfacing of roads is now receiving more attention by our local road authorities and I would suggest the slogan "Irish Tar for Irish Roads" to be kept before those who are responsible for the large importation of bitumen and other products of foreign mineral oil used for road making purposes in this country. In this connection a committee of your association has recently been in touch with the Government of the Free State with results that we hope will eventually have some effect.

I cannot let the subject of residuals pass without mentioning the recent achievement of one of our esteemed Past-Presidents, Mr. J. D. Smith, and the Chief Chemist of his laboratory staff, Mr. Orr, in connection with the production of a distillate from coal tar which has certain marked advantages over petrol and particularly as regards "running costs." If this can be developed commercially, and if the cost of the transport of tar from the various gas-works throughout the country to distillation works in various centres be not prohibitive, it will not only be a boon to the Gas Industry and gas consumers, but will reduce to some extent the enormous sum of money paid in this country for imported foreign petrol.

Public Lighting.

Owing to the later time fixed for the conference and subsequent visit to the gas-works before the meeting of the National Gas Council takes place this afternoon, I have only time to touch upon those other matters which are of paramount importance to the Industry, such as the manner in which gas is holding its own in the sphere of public lighting. As you all know, the principal streets of London, and in fact of most European cities, are largely lighted by modern gas installations. The "Newbridge" and other switches are being sold by the thousand throughout the country for use in connection with existing gas lighting installations, which shows that in lighting, both public and private, gas is still very much alive. It is progressing even in these difficult times without State aid, and, in spite of antiquated and restricted legislation, it continues to grow and will continue to do so provided it is accorded fair play.

A "British Gas Association."

The recent proposal for establishing under one head and possibly one roof a "British Gas Association," which would consolidate the whole of the forces of the Gas Industry, is, to my mind, one which should have the most careful consideration of all the executive bodies of the Industry.

The meeting this afternoon will no doubt provide means for discussing other questions, such as the proposed "unit system" and other alternative methods of charging for gas which are long overdue. Meanwhile I would like to take the opportunity of paying tribute to the Technical Press, who are keeping in the forefront all such projects and give us all that stimulus which is so helpful; also to the officials of our national associations, who, like the Press, give us in this country a very fair share of their attention; and last but not least my thanks are especially due to Mr. Airth, our indefatigable Hon. Secretary, to whose energy and personality the Irish Gas Managers' Association owes so much.

Institution of Gas Engineers

Mr. Webb's Reply to the Discussion on His Paper

Mr. R. N. Webb writes: Mr. B. R. Parkinson says he is of the belief that I am not fully conscious of the ideal I am striving for. Let me try to portray that ideal—"that the gas being evolved in the retorts, in any quantity, shall itself govern the number of revolutions made by the exhauster to deal with that quantity and maintain a definite pressure condition in the retorts within fine limits." This ideal is actually being obtained with the exception that our ways and means are not yet quite perfect and automatic. We have reasons to believe, however, that in the very near future they will be.

Mr. Parkinson says the range of the governor bell has been reduced to practically *nil*. This is quite true, but not at the expense of its mechanical advantage, as is suggested. The mechanical advantage has been so considerably increased by the arrangement shown in fig. 4 that for a lift of governor bell of $\frac{3}{64}$ in. the steam throttle valve is operated from the closed position to that of wide open. As the throttle valve is probably never more than half open (for exhausting the maximum quantity of gas), it is readily seen that, to increase or decrease the number of revolutions sufficiently to deal with the slightly varying quantity of gas, the governor bell is required to move through an exceedingly small range. It is because of this that the impulse obtained from the retorts to the inside of the bell is enabled to exert sufficient influence to control the throttle valve. The mechanism has been made to give the least possible amount of friction (ball bearings are used), and the whole of it only weighs 12 lbs.

In reply to the remarks of Mr. Copp, I shall refer to fig. 7, which shows quite clearly the variation of pressure conditions obtained by our usual working prior to the introduction of the "Control" as described in the paper. Although these conditions were reasonably good, we were not satisfied with them, but, having had experience of retort house governors, we were satisfied that the introduction of them would not give us that fine degree of control that is necessary.

The difficulty we experienced in getting the governor bell to operate quickly was caused by its construction. I feel sure that if the design of the bell be carefully examined it will be obvious that the displacement of water by its movement prevents its responding quickly enough to obtain delicate control. We conclusively proved this before we removed it. Again, the area exposed to the water by this governor bell, *plus* that of the float, tends to sluggishness by reason of surface tension.

I am sorry that we cannot give an analysis of the gas prior to this work, but, since the meeting, the analysis given in fig. 10 has been confirmed, and we have taken several 24-hour charts of the calorific value of the straight coal gas on a Beasley recorder, frequently checked against a Boys calorimeter, which show an average quality of 630 B.Th.U. gross. The variation is about 20 B.Th.U., but this will alter according to the working conditions.

The difference in our present working of pressure conditions within the retorts as compared with our practice for some years is not so great as to enable us to see any difference in the production of retort carbon; our average scurfing periods are about four months.

During the last two or three years we have increased our throughput of coal by 4 cwt. per retort per diem.

I presume that when Mr. Copp mentions an "Arkon" apparatus he is referring to the "Arca" regulator.

NOTES ON PLANT AND PROCESSES

"Red Sphinx" Gas Fires—An Attractive New Catalogue.

Mere words cannot adequately portray the exceedingly pleasing impression created by a first glance through Messrs. William Sugg & Company's new catalogue of their "Red Sphinx" gas fires. But apart from the attractive layout of this publication, it forms a really useful and informative list of the latest designs of the now well-known "Red Sphinx" range of fires.

A beautiful cover design, which seems to contain all the colours of the spectrum, and shows a "Red Sphinx" gas fire in appropriate surround warming a comfortably furnished room, opens upon a set of plates depicting various designs of fire in actual colours and fitted in suitable settings. These finishes include ebonite black, antique brass, oxidized silver, oxidized copper, antique copper, and rustless steel.

The foreword to the catalogue gives particulars of the "Red Sphinx" fire, and claims that besides being a "delight to the eye," these fires are thoroughly well made, excelling in design of burner, workmanship, and finish. They embody the incurved radiant formation and also a patent atomizer which ensures silent lighting, burning, and extinguishing. In the following pages of the catalogue are designs of fire for every purpose—in the first section the ordinary "independent" type, followed by an attractive range of inset fires for use in the modern flat-fronted fireplace without canopy. These fires are of exceedingly neat appearance, fitting flush with the tiling and suitable for all architectural designs. Inset conversion fires are also included in this range.

The final section of the catalogue gives details of miscellaneous fittings, including the "N.S.C." governor for gas fires, which is claimed to ensure uniform heat and uniform consumption at all times, regardless of varying main pressures.

"Consumer-Aid Service."

This is the name adopted by James Stott & Co., Ltd., Vernon Works, Oldham, the well-known hotel, restaurant, and canteen equipment engineers, for a new scheme which they have just introduced. The service which they are prepared to offer should prove of great interest to the Gas Industry, and will enable undertakings to come to the rescue of the "consumer in distress"—an action which has much to recommend it in addition to mere humanitarian motives. When a hotel, restaurant, or café proprietor is confronted with a sudden breakdown of tea or coffee making plant, the consequences are likely to be serious, especially at a busy time in the catering season. Messrs. Stott, no matter what make of apparatus has given rise to the emergency, are prepared under their scheme to offer immediately on loan, and free of charge, an appliance of similar character. Further particulars of the Service can be obtained from the makers, who will be pleased to enrol any firm on the list.

REGISTER OF PATENTS

Gas Refrigerators.—No. 351,794.

Gas Light and Coke Company, Clark, J. G., Masterman, C. A., and Andrew, L. W., all of Westminster, S.W. 1, and Turner, G. A., of Marlborough Hill, N.W. 8.

No. 23,583; Aug. 6, 1930.

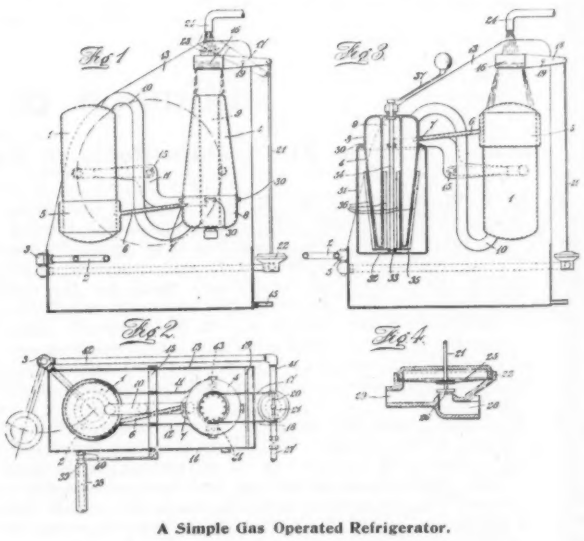
This invention relates to refrigerating apparatus of the kind comprising an evaporator condenser and a generator absorber whose axes, while being out of alignment, are arranged parallel to each other. One end of the evaporator condenser is connected by a pipe to the opposite end of the generator absorber, both evaporator condenser and the generator absorber being so mounted and arranged as to be invertible by rotation in a vertical plane about a horizontal axis disposed between the evaporator condenser and the generator absorber. The invention has for its object to provide an improved apparatus which is safe, efficient, and capable of being operated by an unskilled person.

Fig. 1 is a sectional elevation of a refrigerating apparatus in accordance with the invention; fig. 2 is a plan of fig. 1; fig. 3 shows the apparatus in the evaporating position for use in the formation of ice or ice cream; fig. 4 is a sectional elevation of a device for controlling the supply of gas required for heating purposes.

Referring to the drawing, 1 is the generator absorber adapted to be heated by a gas ring burner 2 rotatable in a horizontal plane on a knuckle joint 3 which is arranged to cut off the gas as soon as the burner 2 is swung back to permit of inversion of the generator absorber 1 and the evaporator condenser 4. The lower end of the generator absorber in the position shown in fig. 1 is surrounded by a water jacket 5, the upper end of which is open, the lower end being sweated or otherwise rigidly secured water tightly to the generator absorber 1. Water is supplied to the jacket 5 through a pipe 6 connected to the jacket and having a trough 7 at its outer end, the outer edge of the trough being shaped to suit the outer lower arcuate form of the evaporator condenser 4. The latter is preferably of cylindrical form at its lower end, as at 8, the remaining portion of the evaporator condenser being of upwardly converging truncated conical form closed at its upper end and having an internal bore 9. The generator absorber is connected at its upper end by a pipe 10, the opposite end of which is connected to the lower end of the cylindrical portion 8 of the evaporator condenser. The generator absorber and the evaporator condenser are interconnected by tie members or bars 11, 12, which are mounted on a horizontal shaft 15 supported by the walls 13, 14, of an open casing, and about which the generator absorber and the evaporator condenser can be turned into the inverted position shown in fig. 3. Disposed at a suitable height above the evaporator condenser is a tray 16 having arms 17, 18, mounted on a pivot 19, extending between and supported by the walls 13 and 14 of the receptacle in which the apparatus is disposed. The free ends of the arms 17, 18, are connected by a rod 20 on which is pivotally supported a rod 21 carrying a gas controlling device 22, so that when the tray 16 is empty the latter tilts upward into the position shown in dotted lines at 23, fig. 1. The tray 16 is disposed below a suitable water supply pipe 24, and the rod is connected to a diaphragm 25 (fig. 4) and a valve 26 in the gas controlling device 22. 27 is a gas supply pipe which is connected to the gas inlet 28 on the gas controlling device 22. 29 is a gas outlet to the gas ring burner 2.

Adjacent to the major diameter end of the truncated evaporating condenser are a number of channel shaped lugs 30 adapted (as by inwardly bent portions) to carry a receptacle 31 open at its upper end and closed at its lower end as at 32. This receptacle is intended to contain water for the formation of ice. The bottom plate of the receptacle 31 is provided with a footstep bearing 33 to receive the end of a manually rotatable shaft 34 carrying a plate 35 provided with upstanding blades 36. The shaft 34 is rotatable by means of a handle 37. The shaft 15 on which the ice bars 11, 12, are mounted carries a handle 38 provided with a spring pressed rod 39 adapted to enter a socket 40 carried by the wall 14 of the receptacle in which the apparatus is disposed. 41, 42 are the gas supply pipes from the gas outlet 29 of the gas controlling device 22 to the knuckle joint 3. The evaporator condenser may be charged with ammoniacal liquor as hereinafter defined through an opening 43 closable by a suitable plug, and is provided with a safety valve 44. 45 is an outlet from the containing receptacle to permit of cooling liquid, such as water, being drained from the receptacle.

The solution intended for use with the present refrigerating apparatus is known, and consists of suitable parts of ammonium



A Simple Gas Operated Refrigerator.

nitrate, ammonium chloride, and distilled water. The purging position (not shown) of the apparatus is that in which the generator absorber is in the lower position—*i.e.*, with the axis of the generator absorber turned downwardly through 90° from the position shown in fig. 3 and with its axis horizontal.

The operation of the apparatus is as follows:

The generator absorber 1 in the position shown in fig. 1 has been charged with evaporant by reason of the fact that in the purging position (not shown) this vessel forms the lowest part of the system and into it all liquid drains. The cooling water discharging from 24 falls into the tray 16 and depresses it, because the holes in this tray are inadequate to allow the water to escape as fast as it runs into the tray. The rod 21 is thereby raised and thus the gas way at 26 is opened. When the gas ring burner 2 is swung into position gas flows thereto and is ignited. Meanwhile water from the tray 16 flows over the evaporator condenser, and some portion is collected in the trough 7 and flows therefrom into the water jacket 5. The refrigerant from 1 is evaporated and driven over by the heat into 4, where, under pressure and the effect of the cooling water, it is condensed. This process continues until all the available refrigerant is removed from 1, by which time the water in 5 is at boiling point. The gas ring is then swung out and this extinguishes the gas. In the event of the apparatus being forgotten and the gas ring left alight, the water in 5 as it evaporates is continually replaced by way of 7 and 6, and thus prevents the generator absorber 1 becoming overheated. The handle 38 is then pulled outwards so as to disengage the end from its recess, and the whole is then swung over, and a recess on the opposite side of the casing is engaged with the apparatus in the position shown in fig. 3. Water now cools the generator absorber 1, which causes the refrigerant in 4 to evaporate and pass back into 1. In so doing heat is absorbed from 4 and is abstracted from any medium surrounding this vessel such as may be contained in the container 31 in the form of water or ice-cream mixture. On completion of the freezing operation the handle 38 is withdrawn from its recess and the apparatus is lowered to the purging position in which the generator absorber forms the lowest part of the system and in which the generator absorber is re-charged.

Dry Gas Meters.—No. 352,083.

JULIUS PINTSCH AKTIENGESELLSCHAFT, of Berlin.

No. 10,908; April 5, 1930. Convention date, April 8, 1929.

This invention relates to a reversing mechanism for the valves of dry gas meters. Reversing mechanism for gas meters furnished with two measuring chambers consists in the majority of cases of a guide lever controlled by the movement of the diaphragm, and a lever actuated upon a tension spring, the second lever being reversed with sudden movement at the end of each movement on the part of the guide lever by the provision of snap members. During the movement, the second lever rests, by means of an end abutment furnished with a slide face, against a corresponding abutment face of the guide lever, or against a coupling member connected therewith, until the spring becomes tensioned during the course of the movement; and the sudden reversal is performed by means thereof at the end of the movement.

According to the invention, valve reversing mechanism for dry gas meters having oscillatory levers, with snapping elements connected by means of a tension spring, is arranged so that the axes of rotation of the levers are perpendicular or approximately perpendicular to each other.

Parliamentary Intelligence

[From Our Special Correspondents.]

House of Lords.

Private Bills.

The Sheffield Gas Bill received the Royal Assent on July 31.

Special Orders.

The Southgate and District Gas Order has been passed by the Special Orders Committee and approved by the House with the following modification: Clause 6, p. 3, line 17, leave out "one-fortieth part" and insert "one-quarter per centum." The alteration merely corrects a misprint.

The following Special Orders, having been passed by the Special Orders Committee, have been approved by the House: Dudley, Brierley Hill, and District; Abergavenny; Wombwell; Cheltenham and District; Holywell and Flint.

House of Commons.

Special Orders.

The following Special Orders have been approved by the House: British Gas Light Company, Ltd., with respect to the Holywell Undertaking; Southgate and District Gas Company with a modification as shown above; Wombwell Urban District Council; Abergavenny Corporation; Cheltenham Gaslight and Coke Company; Town of Dudley Gaslight Company.

(Parliament adjourned on July 31 until Oct. 20, with power to meet earlier in case of emergency.)

Municipal Gas Undertakings' Results in 1930-31.

CHELMSFORD.

The financial result of the year's trading is a gross profit of £19,531. After due payment of capital and other charges, which absorb £14,009, there remains a net profit of £5521, which, with unappropriated balance brought forward from last year of £213, gives a balance of £5734 in hand. At the commencement of the year, the price of gas was 4s. 6d. per 1000 c.ft. (1s. per therm), and this was reduced in June to 4s. 3d. per 1000 c.ft. (11·33d. per therm). Scale reduction was amended at the same time to from 4s. 2d. to 3s. 9d. per 1000 c.ft., according to quantity. Ordinary consumers are allowed 2½ p.ct. discount for prompt payment. The total expenditure on the revenue account during the year has been £40,766, against £39,015 in the previous year, and the total income, £60,297, against £52,194. The total increase in sales over the previous year was, including public lighting, 19,106,000 c.ft., or 10·45 p.ct. This partly resulted from 319 new consumers obtained during the year, and from additional apparatus sold. The net receipts, after deducting the cost of handling, from bye-products, amounts to £10,580, compared with £9375 for the previous year. The production of gas increased on the previous year by 8·68 p.ct.

LEEK.

It was reported to the Leek Urban Council by Mr. W. A. Durmston (Chairman of the Lighting Committee) that the Gas Undertaking showed a net deficit for the year of £548. He said, however, that during the year there had been a big demand for gas appliances on the hire purchase system, and the cost (£1100) would in the next few years be repaid to the Undertaking. Except for this they would have been able to show a profit of over £500. In spite of the bad trade and keen competition from electricity, it was a pleasing feature to note that the consumption of gas had advanced by 1½ million c.ft.

LYTHAM ST. ANNES.

The revenue of the Lytham St. Annes Gas Undertaking last year was £59,807, against £57,934, and the expenditure £41,276, against £43,794. There was an increase in revenue of £1873, and a decrease in expenditure of £2518. Mr. J. H. Ranft (Manager) says the outlook is not encouraging. The entry of politics in the fixing of coal prices, whereby public utility undertakings are compelled to pay a higher price with the intention that such extra cost should be passed on to the gas consumer, would mean a further increase in gas prices.

NEWCASTLE-UNDER-LYME.

The report of the Newcastle-under-Lyme Council Gas Undertaking shows that during the past year a gross profit of £4908 was made, and after payment of all charges there was a net profit of £103, compared with £23 last year. Moving the adoption of the report and accounts at a meeting of the Council, Alderman Beresford (in the absence of Mr. E. M. Hollins, Chairman) said that the Gas Committee were to be congratulated upon the healthy state of the undertaking. The price of gas per 1000 c.ft. was now only 1d. more than it was before the war, while they were selling gas for power at as low as 2s. 6d. per 1000 c.ft.

WOLSTANTON.

A successful year's working of the Wolstanton Gas Undertaking was reported at a meeting of the Urban Council last week. The annual report stated that the output of gas for the year was 144,604,000 c.ft., representing an increase of 3,413,000 c.ft. The total revenue from the sale of gas was £22,206, a decrease of £1019, due to the reduction of 4d. per 1000 c.ft. which came into operation last year. The receipts from residuals amounted to £6514—an increase of £487—making a total income of £29,064. After the payment of capital and other charges there was a net profit of £3230, compared with £3982 last year.

Gas Acts (1920 and 1929) Orders.

SPECIAL ORDERS.

Sedgley Urban District Council.

To empower the Council to use scheduled land for gas purposes, to authorize them to contract for the supply of coke oven gas, and to confer general and incidental powers upon them in connection with their Gas Undertaking.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The volume of business on the Stock Exchange during last week was on a very small scale, so small in fact that prices were not appreciably affected in either direction. The improvement in the German banking situation certainly brought about a slightly firmer tone at the close on Friday; but the general financial outlook will have to become much clearer before commitments from the general public attain anything like normality.

Gas stocks and shares were also affected by the all-round stagnancy. Little business was done, and price changes were few; the most important being a further drop of 10 points to 200 in Imperial Continental ordinary and 2½ points in Oriental ordinary to 98. The only appreciation was a fractional increase in Newcastle £1 units to 17s. 6d. (at Newcastle).

The ordinary stocks of the three Metropolitan Companies have recently been marked down *ex* div., and a good opportunity is available at the present time for those investors requiring permanent holdings to secure these stocks at advantageous prices—viz.:

—	Present Average Price.	Dividend Last Half-Year.	Dividend Year 1930.	Yield on 1930 Dividend.
		P.Ct.	P.Ct.	£ s. d.
Commercial	93½	3	6	6 8 4
Gas Light £1 units	19s.	£2 16s.	£5 12s.	5 17 10
South Metropolitan	102½	2½*	6½	6 1 11

* Interim.

The latter two stocks are usually obtainable; but the Commercial stock is not so frequently in the market, and it may be necessary to place a standing order with a broker to secure a parcel.

Among those companies operating abroad, the ordinary stocks of the European and Oriental Companies are also worth attention at the present low prices. The yield in the case of the former Company, on the basis of last year's distribution of 5¼ p.ct., free of tax, at the present average price of 85, is £7 19s. 4d. The Oriental Company has paid a dividend of 8 p.ct. since 1918, and the yield in this case at 98 works out at £8 3s. 3d. The stock changed hands last year at prices ranging between 105 and 113.

Among last week's interim dividend announcements were the following: Croydon sliding-scale 3½ p.ct., maximum dividend 2½ p.ct.; Newcastle, 2½ p.ct.; Portsmouth consolidated 4 p.ct., maximum dividend 2½ p.ct.; and North Middlesex, 3¾ p.ct. These are all at the same rates as a year ago.

The Cardiff Company's 5 p.ct. redeemable debenture stock has been added to the Stock and Share List this week. This stock was offered in February this year at par, and is redeemable at par (*a*) on Jan. 1, 1965, or (*b*) earlier on Jan. 1, 1960, or on any interest date thereafter on six months' notice from the Company. Interest is payable on Jan. 1 and July 1.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Aug.* 10.

The prices of tar products in fair quantities are as follows:

Pitch is firm at 52s. 6d. per ton f.o.b.

Creosote for export varies from 3¾d. to 5d. per gallon, f.o.b., according to specification.

Pure toluole, 1s. 10d. to 1s. 11d. per gallon.

Pure benzole, about 1s. 4d. per gallon.

95/160 solvent naphtha, about 1s. 4d. per gallon.

Pyridine bases, 3s. to 3s. 8d. per gallon. Prices of spirits are *ex* sellers' works.

Tar Products in the Provinces.

Aug. 10.

The average prices of gas-works products during the week were: Gas-works tar, 20s. 6d. to 24s. 6d. Pitch—East Coast, 52s. 6d. to 53s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 52s. 6d. to 53s. 6d. f.o.b.* Toluole, naked, North, 1s. 6¼d. to 1s. 6¾d. Coal-tar crude naphtha, in bulk, North, 5d. to 5½d. Solvent naphtha, naked, North, 1s. 1½d. to 1s. 2d. Heavy naphtha North, 10½d. to 11d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3½d.; low gravity, 1¼d.; Scotland, 3¼d. to 3½d. Heavy oils, in bulk, North, 5d. to 5½d. Carbolic acid, 60's, 1s. 3d. to 1s. 4d. Naphthalene, £9 to £10. Salts, 50s. to 70s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Aug.* 8.

With improved weather conditions the output of refined tar has increased during the week. Other products continue rather dull.

Pitch.—Value in this area remains at about 40s. to 42s. 6d. per ton, f.o.b. Glasgow with forward indications somewhat higher.

Refined tar to Ministry of Transport specification continues in fair request at 2¼d. to 2¾d. per gallon *ex* works in buyers' packages.

Creosote oil.—Quotations are steady, and certain grades are quite scarce. B.E.S.A. Specification is 2¾d. to 3d. per gallon; low gravity, 3½d. to 3¾d. per gallon; and neutral oil, 3¼d. to 3½d. per gallon; all *ex* makers' works.

Cresylic.—Trading is on a small scale. Pale, 97/99 p.ct., 1s. 3d. to 1s. 4d. per gallon; dark, 97/99 p.ct., 1s. 2d. to 1s. 3d. per gallon; and pale, 99/100 p.ct., 1s. 5d. to 1s. 6d. per gallon; all f.o.r. works.

Crude naphtha.—Value is unchanged at 4¼d. to 4¾d. per gallon according to quality.

Solvent naphtha.—The position is unchanged, orders being scarce. 90/160 is 1s. 2d. to 1s. 3d. per gallon, and 90/190, 11d. to 1s. per gallon.

Motor benzole.—Few orders are being received, and value may be taken at 1s. 2d. to 1s. 3d. per gallon, f.o.r. Works in bulk.

Pyridines.—90/160 grade is 2s. 9d. to 3s. per gallon, and 90/140 grade, 3s. to 3s. 3d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole:

	s.	d.		s.	d.	
Crude benzole	0	5½	to	0	6½	per gallon at works
Motor ,,	1	0	,,	1	1	,, ,, ,,
Pure ,,	1	4	,,	1	5	,, ,, ,,

Trade Notes.

Woodall-Duckham Company Announcement.

As from Aug. 10, the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd., are amalgamating their District Office at 78, King Street, Manchester, with their District Office at 3 and 4, Foster's Buildings, 22, High Street, Sheffield. Mr. S. S. Francis will, however, continue to represent the Woodall-Duckham Company in the Northern area, making the above address in Sheffield his headquarters.

Contracts Advertised To-Day.

Coal.

The Gas Committee of the Marple Urban District Council invite tenders for gas coals. [Advert. on p. 388.]

High-Pressure Main.

Tenders are invited by the Morley Corporation Gas Department for the work and materials in connection with a high-pressure main. [Advert. on p. 388.]

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Aug. 7.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. ...	78—83	...	...
522,992	,,	,,	4	4	Do. 4 p.c. Pref. ...	75—80	...	...
1,551,868	,,	Apl. 9	7⅞	7⅞	Alliance & Dublin Ord. ...	102—107	...	104—105
374,000	,,	July 9	4	4	Do. 4 p.c. Deb. ...	71—76	...	...
522,655	,,	Mar. 5	7	7	Barnet Ord. 7 p.c.	124—129	...	...
300,000	1	Apl. 23	1/4⅛	1/9⅜	Bombay, Ltd.	16/6—18/6	...	...
174,500	10	Mar. 5	9	9	Bournemouth 5 p.c. ...	15—16	...	...
500,050	10	,,	7	7	Do. B 7 p.c. ...	12½—13½	...	...
439,160	10	,,	6	6	Do. Pref. 6 p.c. ...	11½—11⅝	...	...
50,000	Stk.	June 25	3	3	Do. 3 p.c. Deb. ...	60—63	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	80—83	...	...
357,900	,,	Mar. 19	7½	7½	Brighton & Hove 6 p.c. Con.	112—117	...	...
371,880	,,	,,	6½	6½	Do. 5 p.c. Con.	105—108	...	...
1,287,500	,,	July 23	5	5	Bristol 5 p.c. max.	96—97a*	...	...
120,420	,,	June 25	4	4	Do. 1st 4 p.c. Deb. ...	78—80a *	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	78—80a	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	98—99a	...	...
855,000	,,	Apl. 9	7	8	British Ord.	110—115	...	113½—114
100,000	,,	June 25	7	7	Do. 7 p.c. Pref.	110—115	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	77—80	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	97—100	...	96
160,000	,,	June 25	5	5	Cambridge 5 p.c. Deb. ...	98—101	...	...
100,000	10	May 21	6	8	Cape Town, Ltd.	9—10	...	9½
100,000	10	May 7	4½	4½	Do. 4½ p.c. Pref. ...	6½—7½	...	...
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb. ...	72—77	...	...
626,860	,,	July 23	6	6	Cardiff Con. Ord.	95—98*	...	...
237,860	,,	June 25	—	2⅜	Do. 5 p.c. Red. Deb.	99—102	...	...
157,150	,,	Feb. 19	5	6¼	Chester 5 p.c. Ord.	85—90‡	...	...
98,936	1	May 7	†2/-	†2/-	Colombo, Ltd. Ord.... ...	28/—33/-	...	...
24,500	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	17/6—19/6	...	...
609,204	1	Apl. 9	1/4⅛	15·27d	Colonial Gas Assn. Ltd. Ord.	16/—18/-	...	...
296,053	1	,,	1/7⅛	17·67d	Do. 8 p.c. Pref.	17/6—19/6	...	...
2,078,280	Stk.	July 23	6	6	Commercial Ord.	92—95*	...	...
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. ...	59—62	...	...
787,560	,,	Feb. 19	7	7	Croydon sliding scale ...	110—113	...	111½—112
458,100	,,	,,	5	5	Do. max. div.	83—86	...	85—85½
542,270	,,	Mar. 5	7 ·	10	Derby Con.	122—125c	...	...
55,000	,,	June 25	4	4	Do. Deb.	65—70c	...	...
209,000	,,	Mar. 5	5	5	East Hull Ord. 5 p.c. ...	72—75	...	...
1,002,180	,,	Mar. 19	†4	†6½	European, Ltd.	80—90	...	...
18,958,038	,,	July 23	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	18/6—19/6f*	...	19/—19/4½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	65—68*	...	66—67½
4,294,691	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	78—81*	...	79—80
5,694,095	,,	June 11	3	3	Do. 3 p.c. Con. Deb. ...	61—64	−1	61—63½
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	102—105	...	104
2,500,000	,,	,,	—	—	Do. 4½ p.c. Red. Deb. ...	97—100	...	97½—99
161,480	,,	Mar. 5	10	10	Harrogate Cons. 10 p.c. max.	157—162	...	...
82,500	,,	Mar. 19	7	7	Hastings & St. L. 5 p.c. Conv.	98—103	...	...
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	82—85	...	...
70,000	10	Oct. 9	⅛	10	Hongkong & China, Ltd. ...	13—14	...	...
213,200	Stk.	Mar. 5	6	6	Hornsey Con. 3½ p.c. ...	91—94	...	...
2,800,000	,,	May 21	15	25	Imperial Continental Cap.	290—310	−10	295—309½
223,130	,,	Feb. 5	‡3½	3½	Do. 3½ p.c. Red. Deb.	78—88	...	...
235,242	,,	Mar. 5	8½	8½	Lea Bridge 5 p.c. Ord. ...	127—130	...	...
2,145,907	,,	Feb. 19	6	6	Liverpool 5 p.c. Ord. ...	99—100b	...	...
306,083	,,	July 15	4	4	Do. 4 p.c. Deb. ...	79—81b	...	...
165,736	,,	Feb. 19	9	9	Maidstone 5 p.c. Cap. ...	130—135	...	...
63,480	,,	June 25	3	3	Do. 3 p.c. Deb. ...	57—60	...	...
75,000	5	June 11	†10	†10	Malta & Mediterranean ...	6½—7½	...	...
392,000	—	Apl. 2	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	80—85	...	...
675,000	Stk.	May 21	†6	†6	Montevideo, Ltd.	80—90	...	...
2,051,315	,,	Mar. 5	5	5½	Newcastle & Gateshead Con.	17/3—17/9d‡	+/-1½	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	75½—76½d	...	...
691,705	,,	Jan. 8	3½	3½	Do. 3½ p.c. Deb. ...	69—71d	...	...
277,285	,,	May 7	5	5	Do. 5 p.c. Red. Deb.	98—100d	...	...
199,940	,,	Mar. 5	7½	7½	North Middlesex 6 p.c. Con.	115—120	...	...
396,160	,,	Feb. 5	5	5	Northampton 5 p.c. max. ...	74—79	...	...
300,000	,,	Apl. 23	9	7	Oriental, Ltd.	93—103	−2½	94
60,000	5	13 May, '15	—	—	Ottoman	0—½	...	...
205,162	Stk.	June 25	8	8	Plym'th & Stonehouse 5 p.c.	110—115	...	...
424,416	,,	Feb. 19	8	8	Portsm'th Con. Stk. 4 p.c. Std.	122—127	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	78—81	...	...
686,312	,,	July 23	4	4	Primitiva 4 p.c. Rd. Db. 1911	83—86*	...	...
389,813	,,	June 25	4	4	Do. 4 p.c. Cons. Deb.	84—87	...	...
150,000	10	Apl. 9	6	6	San Paulo 6 p.c. Pref. ...	8—8½	...	...
1,736,968	Stk.	Mar. 19	6½	6½	Sheffield Cons.	105—107e	...	...
95,000	,,	July 9	4	4	Do. 4 p.c. Deb.	79—81e	...	...
90,000	10	June 11	†5	†5	South African	3½—5½	...	...
6,709,895	Stk.	July 23	7½	5	South Met. Ord.	101½—103½*	...	102—103
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	112—115*	...	115
1,895,445	,,	July 9	3	3	Do. 3 p.c. Deb. ...	60—63	...	60—62
734,000	,,	Mar. 5	6½	6½	Do. 6½ p.c. Red. Db.	98—100	...	...
1,000,000	,,	July 23	4	5	Do. 5 p.c. Red. Deb.	101—104	+1	102—103½
91,500	,,	Mar. 5	8½	8½	South Shields Con.	113—115d	...	...
1,543,795	,,	Feb. 19	6⅔	6⅔	South Suburban Ord. 5 p.c.	103—106	..	...
668,837	,,	June 25	5	5	Do. 5 p.c. Deb.	100—103	...	...
647,740	,,	Feb. 19	5	5	Southampt'n Ord. 5 p.c. max.	78—81	...	...
121,275	,,	June 25	4	4	Do. 4 p.c. Deb.	77—80	...	...
179,014	,,	Mar. 5	8	8	Sutton Ord.	120—130	...	...
94,500	,,	June 25	5	5	Do. 5 p.c. Deb.	96—99	...	...
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. ...	98—101	...	99
200,000	,,	June 25	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	...	...
1,076,490	,,	Mar. 5	6⅝	6⅝	Tottenham District Ord. ...	103—107	...	104
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	101—104	...	...
199,005	,,	June 11	4	4	Do. 4 p.c. Deb. ...	78—81	...	...
85,701	,,	Mar. 19	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	74—79	...	...
310,694	,,	Mar. 5	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	102—107	...	...
88,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	90—95	...	...
1,322,220	,,	July 9	7	7	Wandsworth, Wimbledon, and Epsom Cons. ...	111—114	...	112¾—113½
426,000	,,	,,	5	5	Do. 5 p.c. Pref.	97—100	...	...
1,013,464	,,	June 25	5	5	Do. 5 p.c. Deb.	100—103	...	98

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. ⅛ Div. = 10 p.ct. p.a. less tax and less tax on interim dividend.

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Unique and Different

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We direct your attention to our modern facilities for the manufacture and repair of all types of Gas Meters, both Wet and Dry.

□ □ □

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Quotations submitted.

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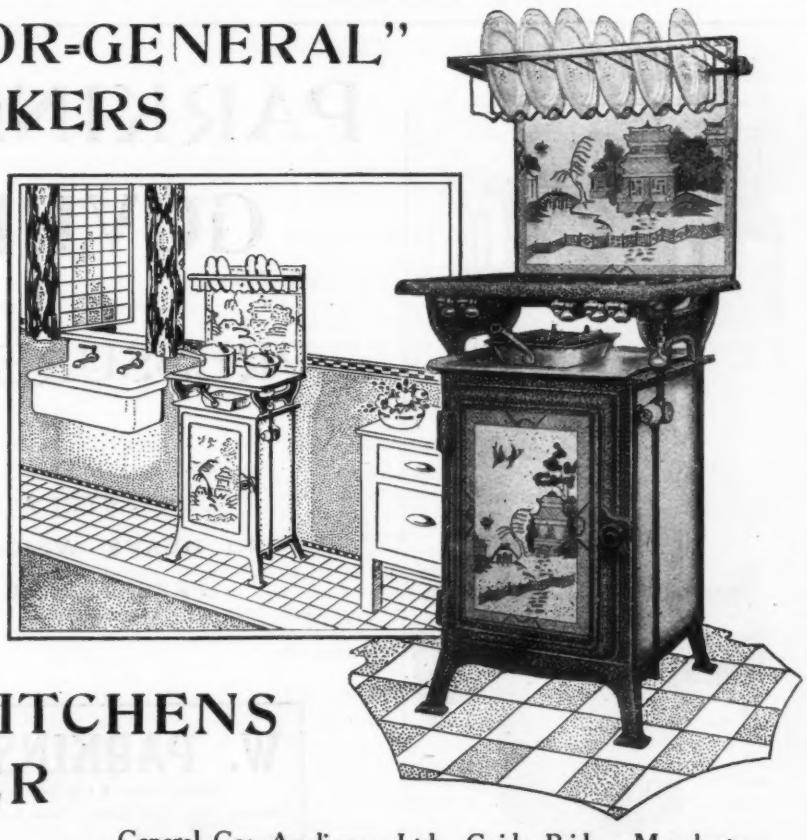

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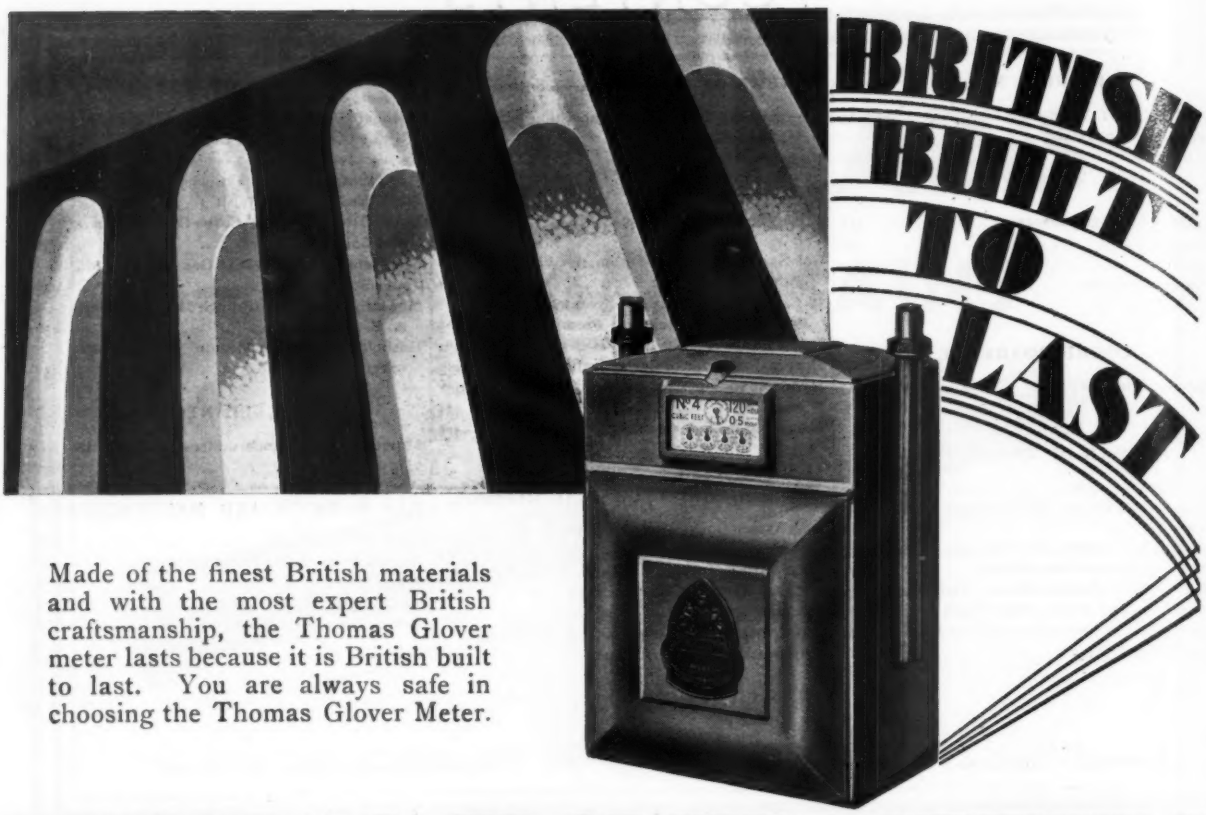

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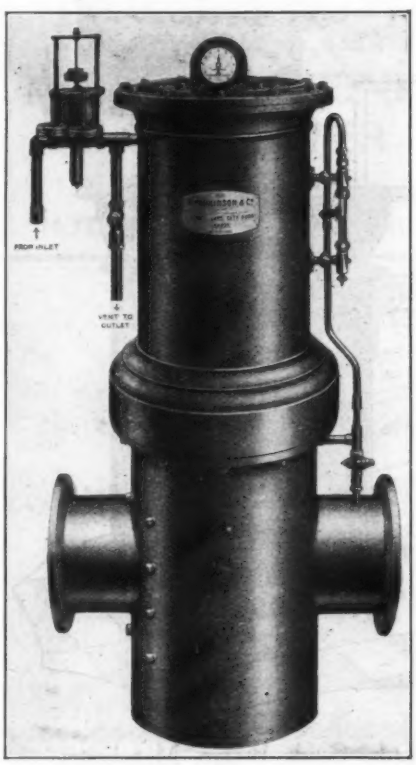

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